Seminari 14

Matematičke metode za informatičare

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Sadržaj

prvi zadatak

drugi zadatak

treći zadatak

četvrti zadatak

peti zadatak

prvi zadatak

Zadatak 1

Odredite lokalne ekstreme funkcije $f(x, y) = (x + 2y)e^{-xy}$.

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Rješenje

$$f_x =$$

$$(uv)'(x) = u'(x) \cdot v(x) + u(x) \cdot v'(x)$$

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Odredite lokalne ekstreme funkcije $f(x, y) = (x + 2y)e^{-xy}$.

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$$f_x = 1$$

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$$f_x = 1 \cdot e^{-xy} +$$

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$$f_x = \big(1 \qquad\qquad\qquad \big)e^{-xy}$$

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$$f_x = \left(1 - xy \qquad \right) e^{-xy}$$

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$$f_x = \left(1 - xy - 2y^2\right) e^{-xy}$$

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$$f_y = \left(2 - x^2 - 2xy\right)e^{-xy}$$

$$\left(1 - xy - 2y^2\right)e^{-xy} = 0$$

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$$f_y = 2 \cdot e^{-xy} + (x + 2y) \cdot e^{-xy} \cdot (-x)$$

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$$\left(1 - xy - 2y^2\right)e^{-xy} = 0$$

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$$\overline{\quad 1 - xy - 2y^2 = 0 \quad}$$

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$$1 - xy - 2y^2 = 0$$

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$$\left(1 - xy - 2y^2\right)e^{-xy} = 0 \; / : e^{-xy}$$

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$$1 - xy - 2y^2 = 0$$

$$2 - x^2 - 2xy = 0$$

$$xy =$$

$$\left(1 - xy - 2y^2\right)e^{-xy} = 0 \;/ : e^{-xy}$$

$$\left(2 - x^2 - 2xy\right)e^{-xy} = 0 \;/ : e^{-xy}$$

$$1 - xy - 2y^2 = 0 \quad \longrightarrow \quad xy = 1 - 2y^2$$

$$2 - x^2 - 2xy = 0$$

$$\left(1 - xy - 2y^2\right)e^{-xy} = 0 \;/ : e^{-xy}$$

$$\left(2 - x^2 - 2xy\right)e^{-xy} = 0 \;/ : e^{-xy}$$

$$1 - xy - 2y^2 = 0$$

$$2 - x^2 - 2xy = 0$$

$$\to xy = 1 - 2y^2 \;/ : y$$

$$\left(1 - xy - 2y^2\right)e^{-xy} = 0 \; \Big/ : e^{-xy}$$

$$\left(2 - x^2 - 2xy\right)e^{-xy} = 0 \; \Big/ : e^{-xy}$$

$$1 - xy - 2y^2 = 0 \quad \longrightarrow \quad xy = 1 - 2y^2 \; \Big/ : y, \; y \neq 0$$

$$2 - x^2 - 2xy = 0$$

$$\left(1 - xy - 2y^2\right)e^{-xy} = 0 \ / : e^{-xy}$$

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$$1 - xy - 2y^2 = 0$$

$$2 - x^2 - 2xy = 0$$

$$xy = 1 - 2y^2 \ / : y, \ y \neq 0$$

$$x =$$

$$\left(1 - xy - 2y^2\right)e^{-xy} = 0 \;/ : e^{-xy}$$

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$$1 - xy - 2y^2 = 0$$

$$2 - x^2 - 2xy = 0$$

$$xy = 1 - 2y^2 \;/ : y, \; y \neq 0$$

$$x = \frac{1}{y}$$

$$\left(1 - xy - 2y^2\right)e^{-xy} = 0 \;/ : e^{-xy}$$

$$\left(2 - x^2 - 2xy\right)e^{-xy} = 0 \;/ : e^{-xy}$$

$$1 - xy - 2y^2 = 0$$

$$2 - x^2 - 2xy = 0$$

$$xy = 1 - 2y^2 \;/ : y, \; y \neq 0$$

$$x = \frac{1}{y} - 2y$$

$$\left(1 - xy - 2y^2\right)e^{-xy} = 0 \; / : e^{-xy}$$

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$$2 - x^2 - 2xy = 0$$

$$xy = 1 - 2y^2 \; / : y, \; y \neq 0$$

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$$\left(1 - xy - 2y^2\right)e^{-xy} = 0 \;/ : e^{-xy}$$

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$$\left(1 - xy - 2y^2\right)e^{-xy} = 0 \;/ : e^{-xy}$$

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$$1 - xy - 2y^2 = 0$$

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$$xy = 1 - 2y^2 \;/ : y, \; y \neq 0$$

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$2 -$

$$\left(1 - xy - 2y^2\right)e^{-xy} = 0 \;/ : e^{-xy}$$

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$$1 - xy - 2y^2 = 0$$

$$2 - x^2 - 2xy = 0$$

$$xy = 1 - 2y^2 \;/ : y, \; y \neq 0$$

$$\boxed{x = \frac{1}{y} - 2y}$$

$$2 - \left(\frac{1}{y} - 2y\right)^2$$

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$$xy = 1 - 2y^2 \;/ : y, \quad y \neq 0$$

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$$2 - \frac{1}{y^2} + 4$$

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$$\boxed{y_1 = \frac{1}{2}} \qquad \boxed{y_2 = -\frac{1}{2}}$$

$$x_1 = \frac{1}{\frac{1}{2}} - 2 \cdot \frac{1}{2}$$

$$x_1 = 2 - 1 \qquad \boxed{x_1 = 1}$$

$$x_2 = \frac{1}{-\frac{1}{2}} - 2 \cdot \frac{-1}{2}$$

$$x_2 = -2 + 1 \qquad \boxed{x_2 = -1}$$

Stacionarne točke

$$\left(1 - xy - 2y^2\right)e^{-xy} = 0 \;/ : e^{-xy}$$

$$\left(2 - x^2 - 2xy\right)e^{-xy} = 0 \;/ : e^{-xy}$$

$$1 - xy - 2y^2 = 0$$

$$2 - x^2 - 2xy = 0$$

$$xy = 1 - 2y^2 \;/ : y, \; y \neq 0$$

$$\boxed{x = \frac{1}{y} - 2y}$$

$$2 - \left(\frac{1}{y} - 2y\right)^2 - 2\left(\frac{1}{y} - 2y\right) y = 0$$

$$2 - \frac{1}{y^2} + 4 - 4y^2 - 2 + 4y^2 = 0$$

$$-\frac{1}{y^2} = -4$$

$$y^2 = \frac{1}{4}$$

$$\boxed{y_1 = \frac{1}{2}} \qquad \boxed{y_2 = -\frac{1}{2}}$$

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Stacionarne točke

$$\left(1, \frac{1}{2}\right)$$

$$\left(1 - xy - 2y^2\right) e^{-xy} = 0 \;/ : e^{-xy}$$

$$\left(2 - x^2 - 2xy\right) e^{-xy} = 0 \;/ : e^{-xy}$$

$$1 - xy - 2y^2 = 0$$

$$2 - x^2 - 2xy = 0$$

$$xy = 1 - 2y^2 \;/ : y,\; y \neq 0$$

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$$x_2 = -2 + 1 \qquad \boxed{x_2 = -1}$$

Stacionarne točke

$x_1 \; y_1$

$$\left(1, \frac{1}{2}\right)$$

$$\left(1 - xy - 2y^2\right)e^{-xy} = 0 \;/ : e^{-xy}$$

$$\left(2 - x^2 - 2xy\right)e^{-xy} = 0 \;/ : e^{-xy}$$

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$$x_2 = \frac{1}{-\frac{1}{2}} - 2 \cdot \frac{-1}{2}$$

$$x_2 = -2 + 1 \qquad \boxed{x_2 = -1}$$

Stacionarne točke

$x_1 \;\; y_1$

$$\left(1, \frac{1}{2}\right) \qquad \left(-1, -\frac{1}{2}\right)$$

$$\left(1 - xy - 2y^2\right)e^{-xy} = 0 \;/ : e^{-xy}$$

$$\left(2 - x^2 - 2xy\right)e^{-xy} = 0 \;/ : e^{-xy}$$

$$1 - xy - 2y^2 = 0$$

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$$x_2 = -2 + 1 \qquad \boxed{x_2 = -1}$$

Stacionarne točke

$$\overset{x_1 \;\; y_1}{\left(1, \frac{1}{2}\right)} \qquad \overset{x_2 \;\; y_2}{\left(-1, -\frac{1}{2}\right)}$$

$$f_x = \left(1 - xy - 2y^2\right) e^{-xy}$$

$$f_y = \left(2 - x^2 - 2xy\right) e^{-xy}$$

$$f_{xx} =$$

$$f(x, y) = (x + 2y)e^{-xy}$$

$$(uv)'(x) = u'(x) \cdot v(x) + u(x) \cdot v'(x)$$

$$f_x = \left(1 - xy - 2y^2\right) e^{-xy}$$

$$f_y = \left(2 - x^2 - 2xy\right) e^{-xy}$$

$$f_{xx} = -y$$

$$f(x, y) = (x + 2y)e^{-xy}$$

$$(uv)'(x) = u'(x) \cdot v(x) + u(x) \cdot v'(x)$$

$$f_x = \left(1 - xy - 2y^2\right) e^{-xy}$$

$$f_y = \left(2 - x^2 - 2xy\right) e^{-xy}$$

$$f_{xx} = -y e^{-xy}$$

$$f(x, y) = (x + 2y)e^{-xy}$$

$$(uv)'(x) = u'(x) \cdot v(x) + u(x) \cdot v'(x)$$

$$f_x = \left(1 - xy - 2y^2\right) e^{-xy}$$

$$f_y = \left(2 - x^2 - 2xy\right) e^{-xy}$$

$$f_{xx} = -ye^{-xy} +$$

$$f(x, y) = (x + 2y)e^{-xy}$$

$$(uv)'(x) = u'(x) \cdot v(x) + u(x) \cdot v'(x)$$

$$f_x = \left(1 - xy - 2y^2\right) e^{-xy}$$

$$f_y = \left(2 - x^2 - 2xy\right) e^{-xy}$$

$$f_{xx} = -y e^{-xy} + \left(1 - xy - 2y^2\right)$$

$$(e^x)' = e^x$$

$$(e^{\text{nešto}})' = e^{\text{nešto}} \cdot (\text{nešto})'$$

$$f(x, y) = (x + 2y)e^{-xy}$$

$$(uv)'(x) = u'(x) \cdot v(x) + u(x) \cdot v'(x)$$

$$f_x = \left(1 - xy - 2y^2\right)e^{-xy}$$

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$$f_{xx} = -y e^{-xy} + \left(1 - xy - 2y^2\right) e^{-xy} \cdot (-y)$$

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$$f_{xx} = \left(\qquad \qquad \qquad \right) y e^{-xy}$$

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$$f_{xx} = -y e^{-xy} + \left(1 - xy - 2y^2\right) e^{-xy} \cdot (-y)$$

$$f_{xx} = \left(2y^2 + xy \qquad\right) y e^{-xy}$$

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$$f_{xx} = \left(2y^2 + xy - 2\right) y e^{-xy}$$

$$(e^x)' = e^x$$

$$\left(e^{\text{nešto}}\right)' = e^{\text{nešto}} \cdot (\text{nešto})'$$

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$$(e^x)' = e^x$$

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$$f_{xx} = -ye^{-xy} + \left(1 - xy - 2y^2\right)e^{-xy} \cdot (-y)$$

$$f_{xx} = \left(2y^2 + xy - 2\right)ye^{-xy}$$

$$f_{xy} = \left(-x - 4y\right)e^{-xy} + \left(1 - xy - 2y^2\right)e^{-xy}$$

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$$f_{xy} = \left(-x - 4y\right) e^{-xy} + \left(1 - xy - 2y^2\right) e^{-xy} \cdot (-x)$$

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$$f_{xy} = \left(-x - 4y\right) e^{-xy} + \left(1 - xy - 2y^2\right) e^{-xy} \cdot (-x)$$

$$f_{xy} =$$

$$(e^x)' = e^x$$

$$\left(e^{\text{nešto}}\right)' = e^{\text{nešto}} \cdot (\text{nešto})'$$

$$f(x, y) = (x + 2y)e^{-xy}$$

$$(uv)'(x) = u'(x) \cdot v(x) + u(x) \cdot v'(x)$$

$$f_x = \left(1 - xy - 2y^2\right) e^{-xy} \qquad f_y = \left(2 - x^2 - 2xy\right) e^{-xy}$$

$$f_{xx} = -y e^{-xy} + \left(1 - xy - 2y^2\right) e^{-xy} \cdot (-y)$$

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$$f_{xy} = \left(-x - 4y\right) e^{-xy} + \left(1 - xy - 2y^2\right) e^{-xy} \cdot (-x)$$

$$f_{xy} = \left(\qquad \qquad \right) e^{-xy}$$

$$(e^x)' = e^x \qquad (e^{\text{nešto}})' = e^{\text{nešto}} \cdot (\text{nešto})' \qquad f(x, y) = (x + 2y) e^{-xy}$$

$$(uv)'(x) = u'(x) \cdot v(x) + u(x) \cdot v'(x)$$

$$f_x = \left(1 - xy - 2y^2\right) e^{-xy}$$

$$f_y = \left(2 - x^2 - 2xy\right) e^{-xy}$$

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$$f_{xx} = \left(2y^2 + xy - 2\right) y e^{-xy}$$

$$f_{xy} = \left(-x - 4y\right) e^{-xy} + \left(1 - xy - 2y^2\right) e^{-xy} \cdot (-x)$$

$$f_{xy} = \left(2xy^2 \qquad\qquad\qquad\qquad \right) e^{-xy}$$

$$(e^x)' = e^x$$

$$(e^{\text{nešto}})' = e^{\text{nešto}} \cdot (\text{nešto})'$$

$$f(x, y) = (x + 2y)e^{-xy}$$

$$(uv)'(x) = u'(x) \cdot v(x) + u(x) \cdot v'(x)$$

$$f_x = \left(1 - xy - 2y^2\right)e^{-xy}$$

$$f_y = \left(2 - x^2 - 2xy\right)e^{-xy}$$

$$f_{xx} = -ye^{-xy} + \left(1 - xy - 2y^2\right)e^{-xy} \cdot (-y)$$

$$f_{xx} = \left(2y^2 + xy - 2\right)ye^{-xy}$$

$$f_{xy} = \left(-x - 4y\right)e^{-xy} + \left(1 - xy - 2y^2\right)e^{-xy} \cdot (-x)$$

$$f_{xy} = \left(2xy^2 + x^2y \qquad\qquad\qquad \right)e^{-xy}$$

$$(e^x)' = e^x$$

$$(e^{\text{nešto}})' = e^{\text{nešto}} \cdot (\text{nešto})'$$

$$f(x, y) = (x + 2y)e^{-xy}$$

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$$f_{xy} = \left(-x - 4y\right)e^{-xy} + \left(1 - xy - 2y^2\right)e^{-xy} \cdot (-x)$$

$$f_{xy} = \left(2xy^2 + x^2y - 2x \qquad \right)e^{-xy}$$

$$(e^x)' = e^x$$

$$(e^{\text{nešto}})' = e^{\text{nešto}} \cdot (\text{nešto})'$$

$$f(x, y) = (x + 2y)e^{-xy}$$

$$(uv)'(x) = u'(x) \cdot v(x) + u(x) \cdot v'(x)$$

$$f_x = \left(1 - xy - 2y^2\right)e^{-xy}$$

$$f_y = \left(2 - x^2 - 2xy\right)e^{-xy}$$

$$f_{xx} = -ye^{-xy} + \left(1 - xy - 2y^2\right)e^{-xy} \cdot (-y)$$

$$f_{xx} = \left(2y^2 + xy - 2\right)ye^{-xy}$$

$$f_{xy} = \left(-x - 4y\right)e^{-xy} + \left(1 - xy - 2y^2\right)e^{-xy} \cdot (-x)$$

$$f_{xy} = \left(2xy^2 + x^2y - 2x - 4y\right)e^{-xy}$$

$$(e^x)' = e^x$$

$$(e^{\text{nešto}})' = e^{\text{nešto}} \cdot (\text{nešto})'$$

$$f(x, y) = (x + 2y)e^{-xy}$$

$$(uv)'(x) = u'(x) \cdot v(x) + u(x) \cdot v'(x)$$

$$f_x = \left(1 - xy - 2y^2\right)e^{-xy}$$

$$f_y = \left(2 - x^2 - 2xy\right)e^{-xy}$$

$$f_{xx} = -ye^{-xy} + \left(1 - xy - 2y^2\right)e^{-xy} \cdot (-y)$$

$$f_{xx} = \left(2y^2 + xy - 2\right)ye^{-xy}$$

$$f_{xy} = \left(-x - 4y\right)e^{-xy} + \left(1 - xy - 2y^2\right)e^{-xy} \cdot (-x)$$

$$f_{xy} = \left(2xy^2 + x^2y - 2x - 4y\right)e^{-xy}$$

$$(e^x)' = e^x$$

$$(e^{\text{nešto}})' = e^{\text{nešto}} \cdot (\text{nešto})'$$

$$f(x, y) = (x + 2y)e^{-xy}$$

$$(uv)'(x) = u'(x) \cdot v(x) + u(x) \cdot v'(x)$$

$$f_x = \left(1 - xy - 2y^2\right) e^{-xy}$$

$$f_y = \left(2 - x^2 - 2xy\right) e^{-xy}$$

$$f_{xx} = -y e^{-xy} + \left(1 - xy - 2y^2\right) e^{-xy} \cdot (-y)$$

$$f_{xx} = \left(2y^2 + xy - 2\right) y e^{-xy}$$

$$f_{xy} = \left(-x - 4y\right) e^{-xy} + \left(1 - xy - 2y^2\right) e^{-xy} \cdot (-x)$$

$$f_{xy} = \left(2xy^2 + x^2 y - 2x - 4y\right) e^{-xy}$$

$$f_{yy} =$$

$$(e^x)' = e^x$$

$$\left(e^{\text{nešto}}\right)' = e^{\text{nešto}} \cdot (\text{nešto})'$$

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$$(uv)'(x) = u'(x) \cdot v(x) + u(x) \cdot v'(x)$$

$$f_x = \left(1 - xy - 2y^2\right)e^{-xy}$$

$$f_y = \left(2 - x^2 - 2xy\right)e^{-xy}$$

$$f_{xx} = -ye^{-xy} + \left(1 - xy - 2y^2\right)e^{-xy} \cdot (-y)$$

$$f_{xx} = \left(2y^2 + xy - 2\right)ye^{-xy}$$

$$f_{xy} = \left(-x - 4y\right)e^{-xy} + \left(1 - xy - 2y^2\right)e^{-xy} \cdot (-x)$$

$$f_{xy} = \left(2xy^2 + x^2y - 2x - 4y\right)e^{-xy}$$

$$f_{yy} = -2x$$

$$(e^x)' = e^x$$

$$\left(e^{\text{nešto}}\right)' = e^{\text{nešto}} \cdot (\text{nešto})'$$

$$f(x, y) = (x + 2y)e^{-xy}$$

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$$f_{xy} = \left(-x - 4y\right) e^{-xy} + \left(1 - xy - 2y^2\right) e^{-xy} \cdot (-x)$$

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$$H(x, y) = \begin{vmatrix} f_{xx}(x, y) & f_{xy}(x, y) \\ f_{xy}(x, y) & f_{yy}(x, y) \end{vmatrix}$$

$$f_{xx} = \left(2y^2 + xy - 2\right) y e^{-xy}$$

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$$H\left(1, \frac{1}{2}\right) =$$

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$$H\left(\overset{x}{1}, \overset{y}{\tfrac{1}{2}}\right) =$$

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$$H\left(\overset{x}{1}, \overset{y}{\frac{1}{2}}\right) = \begin{vmatrix} & \\ & \end{vmatrix}$$

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$$H\left(\overset{x}{1}, \overset{y}{\tfrac{1}{2}}\right) = \begin{vmatrix} -\frac{1}{2} e^{-\frac{1}{2}} & \\ & \end{vmatrix}$$

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$$f_{xy} = \left(2xy^2 + x^2 y - 2x - 4y\right) e^{-xy}$$

$$f_{yy} = \left(x^2 + 2xy - 4\right) x e^{-xy}$$

$$H(x, y) = \begin{vmatrix} f_{xx}(x, y) & f_{xy}(x, y) \\ f_{xy}(x, y) & f_{yy}(x, y) \end{vmatrix}$$

$$H\left(\overset{\color{blue}{x}}{1}, \overset{\color{blue}{y}}{\frac{1}{2}}\right) = \begin{vmatrix} -\frac{1}{2} e^{-\frac{1}{2}} & -3e^{-\frac{1}{2}} \\ & \end{vmatrix}$$

$$f_{xx} = \left(2y^2 + xy - 2\right) ye^{-xy}$$

$$f_{xy} = \left(2xy^2 + x^2y - 2x - 4y\right) e^{-xy}$$

$$f_{yy} = \left(x^2 + 2xy - 4\right) xe^{-xy}$$

$$H(x, y) = \begin{vmatrix} f_{xx}(x, y) & f_{xy}(x, y) \\ f_{xy}(x, y) & f_{yy}(x, y) \end{vmatrix}$$

$$H\left(\overset{x}{1}, \overset{y}{\frac{1}{2}}\right) = \begin{vmatrix} -\frac{1}{2}e^{-\frac{1}{2}} & -3e^{-\frac{1}{2}} \\ -3e^{-\frac{1}{2}} & \end{vmatrix}$$

$$f_{xx} = \left(2y^2 + xy - 2\right) y e^{-xy}$$

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$$f_{xx} = \left(2y^2 + xy - 2\right) y e^{-xy}$$

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$$f_{xx} = \left(2y^2 + xy - 2\right) ye^{-xy}$$

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sedlasta točka

$$f_{xx} = \left(2y^2 + xy - 2\right) y e^{-xy}$$

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sedlasta točka

$$H\left(-1, -\frac{1}{2}\right) =$$

$$f_{xx} = \left(2y^2 + xy - 2\right) y e^{-xy}$$

$$f_{xy} = \left(2xy^2 + x^2 y - 2x - 4y\right) e^{-xy}$$

$$f_{yy} = \left(x^2 + 2xy - 4\right) x e^{-xy}$$

$$H(x,y) = \begin{vmatrix} f_{xx}(x,y) & f_{xy}(x,y) \\ f_{xy}(x,y) & f_{yy}(x,y) \end{vmatrix}$$

$$H\left(\overset{x}{1}, \overset{y}{\frac{1}{2}}\right) = \begin{vmatrix} -\frac{1}{2}e^{-\frac{1}{2}} & -3e^{-\frac{1}{2}} \\ -3e^{-\frac{1}{2}} & -2e^{-\frac{1}{2}} \end{vmatrix} = e^{-1} - 9e^{-1} = -8e^{-1} < 0$$

sedlasta točka

$$H\left(\overset{x}{-1}, \overset{y}{-\frac{1}{2}}\right) =$$

$$f_{xx} = \left(2y^2 + xy - 2\right) y e^{-xy}$$

$$f_{xy} = \left(2xy^2 + x^2 y - 2x - 4y\right) e^{-xy}$$

$$f_{yy} = \left(x^2 + 2xy - 4\right) x e^{-xy}$$

$$H(x,y) = \begin{vmatrix} f_{xx}(x,y) & f_{xy}(x,y) \\ f_{xy}(x,y) & f_{yy}(x,y) \end{vmatrix}$$

$$H\left(\overset{x}{1}, \overset{y}{\tfrac{1}{2}}\right) = \begin{vmatrix} -\frac{1}{2}e^{-\frac{1}{2}} & -3e^{-\frac{1}{2}} \\ -3e^{-\frac{1}{2}} & -2e^{-\frac{1}{2}} \end{vmatrix} = e^{-1} - 9e^{-1} = -8e^{-1} < 0$$

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$$f_{xx} = \left(2y^2 + xy - 2\right) ye^{-xy}$$

$$f_{xy} = \left(2xy^2 + x^2y - 2x - 4y\right) e^{-xy}$$

$$f_{yy} = \left(x^2 + 2xy - 4\right) xe^{-xy}$$

$$H(x,y) = \begin{vmatrix} f_{xx}(x,y) & f_{xy}(x,y) \\ f_{xy}(x,y) & f_{yy}(x,y) \end{vmatrix}$$

$$H\left(\overset{x}{1}, \overset{y}{\frac{1}{2}}\right) = \begin{vmatrix} -\frac{1}{2}e^{-\frac{1}{2}} & -3e^{-\frac{1}{2}} \\ -3e^{-\frac{1}{2}} & -2e^{-\frac{1}{2}} \end{vmatrix} = e^{-1} - 9e^{-1} = -8e^{-1} < 0$$

sedlasta točka

$$H\left(\overset{x}{-1}, \overset{y}{-\frac{1}{2}}\right) = \begin{vmatrix} \frac{1}{2}e^{-\frac{1}{2}} & 3e^{-\frac{1}{2}} \\ & \end{vmatrix}$$

$$f_{xx} = \left(2y^2 + xy - 2\right) y e^{-xy}$$

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sedlasta točka

$$H\left(\overset{x}{-1}, \overset{y}{-\frac{1}{2}}\right) = \begin{vmatrix} \frac{1}{2}e^{-\frac{1}{2}} & 3e^{-\frac{1}{2}} \\ 3e^{-\frac{1}{2}} & 2e^{-\frac{1}{2}} \end{vmatrix}$$

$$f_{xx} = \left(2y^2 + xy - 2\right) y e^{-xy}$$

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$$H(x, y) = \begin{vmatrix} f_{xx}(x, y) & f_{xy}(x, y) \\ f_{xy}(x, y) & f_{yy}(x, y) \end{vmatrix}$$

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sedlasta točka

$$H\left(\overset{x}{-1}, \overset{y}{-\frac{1}{2}}\right) = \begin{vmatrix} \frac{1}{2} e^{-\frac{1}{2}} & 3e^{-\frac{1}{2}} \\ 3e^{-\frac{1}{2}} & 2e^{-\frac{1}{2}} \end{vmatrix} = e^{-1}$$

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sedlasta točka

$$H\left(\overset{x}{-1}, \overset{y}{-\frac{1}{2}}\right) = \begin{vmatrix} \frac{1}{2}e^{-\frac{1}{2}} & 3e^{-\frac{1}{2}} \\ 3e^{-\frac{1}{2}} & 2e^{-\frac{1}{2}} \end{vmatrix} = e^{-1} - 9e^{-1}$$

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$$H\left(\overset{x}{-1}, \overset{y}{-\frac{1}{2}}\right) = \begin{vmatrix} \frac{1}{2}e^{-\frac{1}{2}} & 3e^{-\frac{1}{2}} \\ 3e^{-\frac{1}{2}} & 2e^{-\frac{1}{2}} \end{vmatrix} = e^{-1} - 9e^{-1} = -8e^{-1}$$

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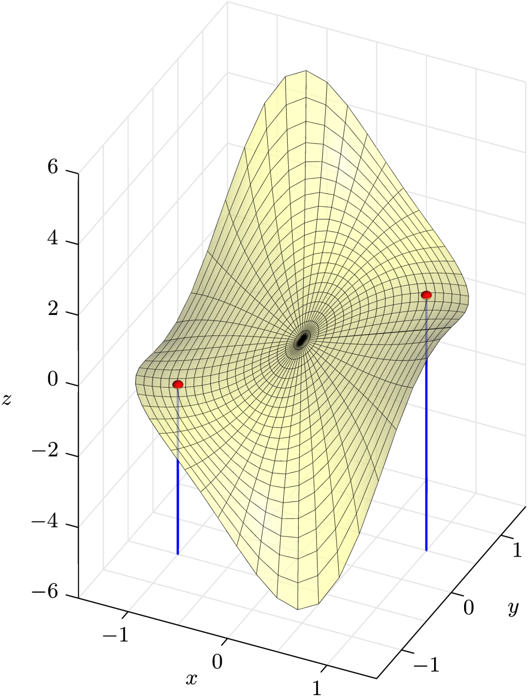
sedlasta točka



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4
2
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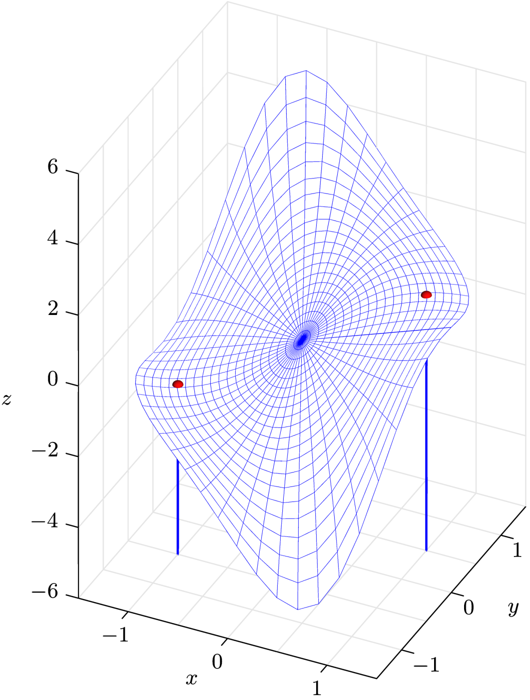
6
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0
−1
y

drugi zadatak

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x, y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x, y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x =$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x, y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x, y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x$ $\qquad$ $f_y =$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x, y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x$ $\qquad$ $f_y = 18xy$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x, y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x$ $\qquad$ $f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$\begin{aligned} 6x^2 + 9y^2 + 30x &= 0 \\ 18xy + 54y &= 0 \end{aligned}$$

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$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$\begin{aligned} 6x^2 + 9y^2 + 30x &= 0 \;/ : 3 \\ 18xy + 54y &= 0 \\ \hline \end{aligned}$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$\begin{aligned} 6x^2 + 9y^2 + 30x &= 0 \; / : 3 \\ 18xy + 54y &= 0 \; / : 18 \end{aligned}$$

Zadatak 2

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$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

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$$\begin{aligned} 6x^2 + 9y^2 + 30x &= 0 \;/:3 \\ 18xy + 54y &= 0 \;/:18 \\ \hline 2x^2 + 3y^2 + 10x &= 0 \end{aligned}$$

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Zadatak 2

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$$\begin{aligned} 2x^2 + 3y^2 + 10x &= 0 \\ xy + 3y &= 0 \end{aligned} \qquad y(x+3) = 0$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

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$$y(x+3) = 0$$

$$y = 0$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x, y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

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$$y(x+3) = 0$$

$$\boxed{y = 0} \qquad x = -3$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

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$$\begin{aligned} 6x^2 + 9y^2 + 30x &= 0 \;/:3 \\ 18xy + 54y &= 0 \;/:18 \\ \hline 2x^2 + 3y^2 + 10x &= 0 \\ xy + 3y &= 0 \\ \hline \end{aligned}$$

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Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

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Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$\begin{aligned} 6x^2 + 9y^2 + 30x &= 0 \;/:3 \\ 18xy + 54y &= 0 \;/:18 \end{aligned}$$

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Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \;/:3$$
$$18xy + 54y = 0 \;/:18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$$y = 0 \qquad x = -3$$

$$2x^2 + 10x = 0$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \;/:3$$
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$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$y = 0$ $\qquad$ $x = -3$

$$2x^2 + 10x = 0 \;/:2$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

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Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \;/:3$$
$$18xy + 54y = 0 \;/:18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$$y = 0 \qquad x = -3$$

$$2x^2 + 10x = 0 \;/:2$$
$$x(x+5) = 0$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

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$$\begin{aligned} 2x^2 + 3y^2 + 10x &= 0 \\ xy + 3y &= 0 \end{aligned}$$

$$y(x+3) = 0$$

$$\boxed{y = 0} \qquad \boxed{x = -3}$$

$$2x^2 + 10x = 0 \;/:2$$

$$x(x+5) = 0$$

$$x_1 = 0,$$

Zadatak 2

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Rješenje

$$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$$

$$6x^2 + 9y^2 + 30x = 0 \;/:3$$
$$18xy + 54y = 0 \;/:18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$$\boxed{y = 0} \qquad \boxed{x = -3}$$

$$2x^2 + 10x = 0 \;/:2$$
$$x(x+5) = 0$$
$$x_1 = 0, \quad x_2 = -5$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

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$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

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$$xy + 3y = 0$$

$$y(x+3) = 0$$

$$\boxed{y = 0} \qquad \boxed{x = -3}$$

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$$x(x+5) = 0$$
$$\boxed{x_1 = 0, \quad x_2 = -5}$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

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$$xy + 3y = 0$$

$$y(x+3) = 0$$

$$\boxed{y = 0} \qquad \boxed{x = -3}$$

$$2x^2 + 10x = 0 \;/:2$$
$$x(x+5) = 0$$
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Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

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$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$$\boxed{y = 0} \qquad \boxed{x = -3}$$

$$2x^2 + 10x = 0 \;/:2 \qquad 18$$
$$x(x+5) = 0$$
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Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

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$$\begin{aligned} 2x^2 + 3y^2 + 10x &= 0 \\ xy + 3y &= 0 \end{aligned}$$

$$y(x+3) = 0$$

$$\boxed{y = 0} \qquad \boxed{x = -3}$$

$$2x^2 + 10x = 0 \;/:2 \qquad 18 + 3y^2$$

$$x(x+5) = 0$$

$$\boxed{x_1 = 0, \quad x_2 = -5}$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x, y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \;/ :3$$
$$18xy + 54y = 0 \;/ :18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$$\boxed{y = 0} \qquad \boxed{x = -3}$$

$$2x^2 + 10x = 0 \;/ :2 \qquad 18 + 3y^2 - 30$$

$$x(x+5) = 0$$

$$\boxed{x_1 = 0, \quad x_2 = -5}$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \;/:3$$
$$18xy + 54y = 0 \;/:18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$$\boxed{y = 0} \qquad \boxed{x = -3}$$

$$2x^2 + 10x = 0 \;/:2 \qquad 18 + 3y^2 - 30 = 0$$

$$x(x+5) = 0$$

$$\boxed{x_1 = 0, \quad x_2 = -5}$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$\begin{aligned} 6x^2 + 9y^2 + 30x &= 0 \;/:3 \\ 18xy + 54y &= 0 \;/:18 \end{aligned}$$

$$\begin{aligned} 2x^2 + 3y^2 + 10x &= 0 \\ xy + 3y &= 0 \end{aligned}$$

$$y(x+3) = 0$$

$$\boxed{y = 0} \qquad \boxed{x = -3}$$

$$2x^2 + 10x = 0 \;/:2 \qquad 18 + 3y^2 - 30 = 0$$

$$x(x+5) = 0 \qquad 3y^2 = 12$$

$$\boxed{x_1 = 0, \quad x_2 = -5}$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x, y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x$ $\qquad$ $f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \;/:3$$
$$18xy + 54y = 0 \;/:18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$y = 0$ $\qquad$ $x = -3$

$$2x^2 + 10x = 0 \;/:2 \qquad 18 + 3y^2 - 30 = 0$$
$$x(x+5) = 0 \qquad 3y^2 = 12 \;/:3$$

$$x_1 = 0, \quad x_2 = -5$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \;/:3$$
$$18xy + 54y = 0 \;/:18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$$\boxed{y = 0} \qquad \boxed{x = -3}$$

$$2x^2 + 10x = 0 \;/:2 \qquad 18 + 3y^2 - 30 = 0$$

$$x(x+5) = 0 \qquad 3y^2 = 12 \;/:3 \qquad y^2 = 4$$

$$\boxed{x_1 = 0, \quad x_2 = -5}$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \;/:3$$
$$18xy + 54y = 0 \;/:18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$$\boxed{y = 0} \qquad \boxed{x = -3}$$

$$2x^2 + 10x = 0 \;/:2 \qquad 18 + 3y^2 - 30 = 0$$

$$x(x+5) = 0 \qquad 3y^2 = 12 \;/:3 \qquad y^2 = 4$$

$$\boxed{x_1 = 0, \quad x_2 = -5} \qquad y_1 = 2,$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \; / : 3$$
$$18xy + 54y = 0 \; / : 18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$$\boxed{y = 0} \qquad \boxed{x = -3}$$

$$2x^2 + 10x = 0 \; / : 2 \qquad 18 + 3y^2 - 30 = 0$$
$$x(x+5) = 0 \qquad 3y^2 = 12 \; / : 3 \qquad y^2 = 4$$
$$\boxed{x_1 = 0, \quad x_2 = -5} \qquad y_1 = 2, \quad y_2 = -2$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \; / : 3$$
$$18xy + 54y = 0 \; / : 18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$$\boxed{y = 0} \qquad \boxed{x = -3}$$

$$2x^2 + 10x = 0 \; / : 2 \qquad 18 + 3y^2 - 30 = 0$$

$$x(x+5) = 0 \qquad 3y^2 = 12 \; / : 3 \qquad y^2 = 4$$

$$\boxed{x_1 = 0, \quad x_2 = -5} \qquad \boxed{y_1 = 2, \quad y_2 = -2}$$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

Stacionarne točke

$$6x^2 + 9y^2 + 30x = 0 \ / :3$$
$$18xy + 54y = 0 \ / :18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$y = 0 \qquad x = -3$

$2x^2 + 10x = 0 \ / :2 \qquad 18 + 3y^2 - 30 = 0$

$x(x+5) = 0 \qquad 3y^2 = 12 \ / :3 \qquad y^2 = 4$

$x_1 = 0, \quad x_2 = -5 \qquad y_1 = 2, \quad y_2 = -2$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \; / :3$$
$$18xy + 54y = 0 \; / :18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$y = 0$ | $x = -3$

$$2x^2 + 10x = 0 \; / :2$$
$$x(x+5) = 0$$
$$x_1 = 0, \quad x_2 = -5$$

$$18 + 3y^2 - 30 = 0$$
$$3y^2 = 12 \; / :3 \qquad y^2 = 4$$
$$y_1 = 2, \quad y_2 = -2$$

Stacionarne točke

$(0, 0)$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x, y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x$ $\qquad$ $f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \;/:3$$
$$18xy + 54y = 0 \;/:18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$$\boxed{y = 0} \qquad \boxed{x = -3}$$

$$2x^2 + 10x = 0 \;/:2 \qquad 18 + 3y^2 - 30 = 0$$
$$x(x+5) = 0 \qquad 3y^2 = 12 \;/:3 \qquad y^2 = 4$$
$$\boxed{x_1 = 0, \quad x_2 = -5} \qquad \boxed{y_1 = 2, \quad y_2 = -2}$$

Stacionarne točke

x_1 y

$(0, 0)$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \;/:3$$
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$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$y = 0$ $\qquad$ $x = -3$

$$2x^2 + 10x = 0 \;/:2 \qquad 18 + 3y^2 - 30 = 0$$
$$x(x+5) = 0 \qquad 3y^2 = 12 \;/:3 \qquad y^2 = 4$$
$$x_1 = 0, \quad x_2 = -5 \qquad y_1 = 2, \quad y_2 = -2$$

Stacionarne točke

$x_1 \; y$

$(0,0) \qquad (-5,0)$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \;/ :3$$
$$18xy + 54y = 0 \;/ :18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$y = 0$ $\qquad$ $x = -3$

$2x^2 + 10x = 0 \;/ :2 \qquad 18 + 3y^2 - 30 = 0$

$x(x+5) = 0 \qquad 3y^2 = 12 \;/ :3 \qquad y^2 = 4$

$x_1 = 0, \quad x_2 = -5 \qquad y_1 = 2, \quad y_2 = -2$

Stacionarne točke

x_1 y	x_2 y
$(0,0)$	$(-5,0)$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x$ $\qquad$ $f_y = 18xy + 54y$

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$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$y = 0$ $\qquad$ $x = -3$

$$2x^2 + 10x = 0 \;/:2 \qquad 18 + 3y^2 - 30 = 0$$
$$x(x+5) = 0 \qquad 3y^2 = 12 \;/:3 \qquad y^2 = 4$$

$x_1 = 0, \quad x_2 = -5$ $\qquad$ $y_1 = 2, \quad y_2 = -2$

Stacionarne točke

x_1 y	x_2 y
$(0,0)$	$(-5,0)$
$(-3,2)$	

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \ / :3$$
$$18xy + 54y = 0 \ / :18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$y = 0$ | $x = -3$

$$2x^2 + 10x = 0 \ / :2 \qquad 18 + 3y^2 - 30 = 0$$
$$x(x+5) = 0 \qquad 3y^2 = 12 \ / :3 \qquad y^2 = 4$$

$x_1 = 0, \quad x_2 = -5$ | $y_1 = 2, \quad y_2 = -2$

Stacionarne točke

$(0,0)$ (x_1, y), $(-5,0)$ (x_2, y), $(-3,2)$ (x, y_1)

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \;/:3$$
$$18xy + 54y = 0 \;/:18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$y = 0$ $x = -3$

$$2x^2 + 10x = 0 \;/:2 \qquad 18 + 3y^2 - 30 = 0$$
$$x(x+5) = 0 \qquad 3y^2 = 12 \;/:3 \qquad y^2 = 4$$
$$x_1 = 0, \quad x_2 = -5 \qquad y_1 = 2, \quad y_2 = -2$$

Stacionarne točke

(x_1, y): $(0,0)$ (x_2, y): $(-5,0)$

(x, y_1): $(-3,2)$ $(-3,-2)$

Zadatak 2

Odredite lokalne ekstreme i sedlaste točke funkcije

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2.$$

Rješenje

$f_x = 6x^2 + 9y^2 + 30x$ $\qquad f_y = 18xy + 54y$

$$6x^2 + 9y^2 + 30x = 0 \; / :3$$
$$18xy + 54y = 0 \; / :18$$

$$2x^2 + 3y^2 + 10x = 0$$
$$xy + 3y = 0$$

$$y(x+3) = 0$$

$y = 0$ $\qquad x = -3$

$$2x^2 + 10x = 0 \; / :2$$
$$x(x+5) = 0$$
$$x_1 = 0, \quad x_2 = -5$$

$$18 + 3y^2 - 30 = 0$$
$$3y^2 = 12 \; / :3 \qquad y^2 = 4$$
$$y_1 = 2, \quad y_2 = -2$$

Stacionarne točke

$(0,0)$ (x_1, y) $\quad (-5,0)$ (x_2, y)

$(-3,2)$ (x, y_1) $\quad (-3,-2)$ (x, y_2)

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$f_{xx} =$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} =$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$$f_{xx} = 12x + 30$$

$$f_{xy} = 18y$$

$$f_{yy} =$$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$$H(x, y) = \begin{vmatrix} & \\ & \end{vmatrix}$$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$$H(x,y) = \begin{vmatrix} 12x + 30 & \\ & \end{vmatrix}$$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

Stacionarne točke

x_1 y $(0, 0)$

x_2 y $(-5, 0)$

x y_1 $(-3, 2)$

x y_2 $(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$$H(x,y) = \begin{vmatrix} 12x + 30 & \\ & 18x + 54 \end{vmatrix}$$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

Stacionarne točke

x_1 y $(0, 0)$	x_2 y $(-5, 0)$
x y_1 $(-3, 2)$	x y_2 $(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$ $f_y = 18xy + 54y$

$$H(x,y) = \begin{vmatrix} 12x + 30 & 18y \\ & 18x + 54 \end{vmatrix}$$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$$H(x,y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x, y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

$H(-3, 2) =$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$$

$$f_{xx} = 12x + 30$$

$$f_{xy} = 18y$$

$$f_{yy} = 18x + 54$$

$$H(x,y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

Stacionarne točke

$\overset{x_1}{(0}, \overset{y}{0)}$ $\quad$ $\overset{x_2}{(-5}, \overset{y}{0)}$

$\overset{x}{(-3}, \overset{y_1}{2)}$ $\quad$ $\overset{x}{(-3}, \overset{y_2}{-2)}$

$$H(\overset{x}{-3}, \overset{y}{2}) =$$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} & \\ & \end{vmatrix}$$

Stacionarne točke

$(\overset{x_1}{0}, \overset{y}{0})$ $(\overset{x_2}{-5}, \overset{y}{0})$

$(\overset{x}{-3}, \overset{y_1}{2})$ $(\overset{x}{-3}, \overset{y_2}{-2})$

$$f_x = 6x^2 + 9y^2 + 30x$$

$$f_y = 18xy + 54y$$

$$f_{xx} = 12x + 30$$

$$f_{xy} = 18y$$

$$f_{yy} = 18x + 54$$

$$H(x, y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & \\ & \end{vmatrix}$$

Stacionarne točke

$(\overset{x_1}{0}, \overset{y}{0})$ $(\overset{x_2}{-5}, \overset{y}{0})$

$(\overset{x}{-3}, \overset{y_1}{2})$ $(\overset{x}{-3}, \overset{y_2}{-2})$

$$f_x = 6x^2 + 9y^2 + 30x$$

$$f_y = 18xy + 54y$$

$$f_{xx} = 12x + 30$$

$$f_{xy} = 18y$$

$$f_{yy} = 18x + 54$$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

Stacionarne točke

$\overset{x_1}{(0}, \overset{y}{0)}$	$\overset{x_2}{(-5}, \overset{y}{0)}$
$\overset{x}{(-3}, \overset{y_1}{2)}$	$\overset{x}{(-3}, \overset{y_2}{-2)}$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ & \end{vmatrix}$$

$f_x = 6x^2 + 9y^2 + 30x$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & \end{vmatrix}$$

Stacionarne točke

$\overset{x_1}{(0}, \overset{y}{0)}$ $\overset{x_2}{(-5}, \overset{y}{0)}$

$\overset{x}{(-3}, \overset{y_1}{2)}$ $\overset{x}{(-3}, \overset{y_2}{-2)}$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$$f_{xx} = 12x + 30$$
$$f_{xy} = 18y$$
$$f_{yy} = 18x + 54$$

$$H(x, y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix}$$

Stacionarne točke

$(\overset{x_1}{0}, \overset{y}{0})$ $\quad$ $(\overset{x_2}{-5}, \overset{y}{0})$

$(\overset{x}{-3}, \overset{y_1}{2})$ $\quad$ $(\overset{x}{-3}, \overset{y_2}{-2})$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$$f_{xx} = 12x + 30$$
$$f_{xy} = 18y$$
$$f_{yy} = 18x + 54$$

$$H(x,y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296$$

Stacionarne točke

$(\overset{x_1}{0}, \overset{y}{0})$ $\quad$ $(\overset{x_2}{-5}, \overset{y}{0})$

$(\overset{x}{-3}, \overset{y_1}{2})$ $\quad$ $(\overset{x}{-3}, \overset{y_2}{-2})$

$f_x = 6x^2 + 9y^2 + 30x$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

Stacionarne točke

$(\overset{x_1}{0}, \overset{y}{0})$ $(\overset{x_2}{-5}, \overset{y}{0})$

$(\overset{x}{-3}, \overset{y_1}{2})$ $(\overset{x}{-3}, \overset{y_2}{-2})$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x, y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0 \rightarrow \text{sedlasta točka}$$

Stacionarne točke

$\overset{x_1}{0}, \overset{y}{0}$: $(0, 0)$ $\quad$ $\overset{x_2}{-5}, \overset{y}{0}$: $(-5, 0)$

$\overset{x}{-3}, \overset{y_1}{2}$: $(-3, 2)$ $\quad$ $\overset{x}{-3}, \overset{y_2}{-2}$: $(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0 \rightarrow \text{sedlasta točka}$$

$$H(-3,-2) =$$

Stacionarne točke

$(0,0)$ (x_1, y) $\quad$ $(-5,0)$ (x_2, y)

$(-3,2)$ (x, y_1) $\quad$ $(-3,-2)$ (x, y_2)

$f_x = 6x^2 + 9y^2 + 30x$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) =$$

Stacionarne točke

$(\overset{x_1}{0}, \overset{y}{0})$	$(\overset{x_2}{-5}, \overset{y}{0})$
$(\overset{x}{-3}, \overset{y_1}{2})$	$(\overset{x}{-3}, \overset{y_2}{-2})$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} & \\ & \end{vmatrix}$$

Stacionarne točke

$(\overset{x_1}{0}, \overset{y}{0})$ $\quad$ $(\overset{x_2}{-5}, \overset{y}{0})$

$(\overset{x}{-3}, \overset{y_1}{2})$ $\quad$ $(\overset{x}{-3}, \overset{y_2}{-2})$

$f_x = 6x^2 + 9y^2 + 30x$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & \\ & \end{vmatrix}$$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0 \rightarrow \text{sedlasta točka}$$

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ & \end{vmatrix}$$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x, y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

Stacionarne točke

$\overset{x_1}{} \overset{y}{}$ $(0, 0)$ $\quad$ $\overset{x_2}{} \overset{y}{}$ $(-5, 0)$

$\overset{x}{} \overset{y_1}{}$ $(-3, 2)$ $\quad$ $\overset{x}{} \overset{y_2}{}$ $(-3, -2)$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & \end{vmatrix}$$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$$f_{xx} = 12x + 30$$
$$f_{xy} = 18y$$
$$f_{yy} = 18x + 54$$

$$H(x, y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix}$$

Stacionarne točke

$(\overset{x_1}{0}, \overset{y}{0})$ $(\overset{x_2}{-5}, \overset{y}{0})$

$(\overset{x}{-3}, \overset{y_1}{2})$ $(\overset{x}{-3}, \overset{y_2}{-2})$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296$$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

Stacionarne točke

$\overset{x_1\ y}{(0,0)}$ $\quad$ $\overset{x_2\ y}{(-5,0)}$

$\overset{x\ y_1}{(-3,2)}$ $\quad$ $\overset{x\ y_2}{(-3,-2)}$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

Stacionarne točke

x_1 y: $(0,0)$	x_2 y: $(-5,0)$
x y_1: $(-3,2)$	x y_2: $(-3,-2)$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

$$H(\underset{x}{-3}, \underset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\underset{x}{-3}, \underset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

Stacionarne točke

$(\underset{x_1}{0}, \underset{y}{0})$	$(\underset{x_2}{-5}, \underset{y}{0})$
$(\underset{x}{-3}, \underset{y_1}{2})$	$(\underset{x}{-3}, \underset{y_2}{-2})$

$$H(0,0) =$$

$f_x = 6x^2 + 9y^2 + 30x$ $f_y = 18xy + 54y$

$$f_{xx} = 12x + 30$$
$$f_{xy} = 18y$$
$$f_{yy} = 18x + 54$$

$$H(x,y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

Stacionarne točke

$(0,0)$ (x_1, y)	$(-5,0)$ (x_2, y)
$(-3,2)$ (x, y_1)	$(-3,-2)$ (x, y_2)

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

$$H(\overset{x}{0}, \overset{y}{0}) =$$

$$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$$

$$f_{xx} = 12x + 30$$

$$f_{xy} = 18y$$

$$f_{yy} = 18x + 54$$

$$H(x,y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{0}, \overset{y}{0}) = \begin{vmatrix} & \\ & \end{vmatrix}$$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

Stacionarne točke

$\overset{x_1\ y}{(0,0)}$ $\quad$ $\overset{x_2\ y}{(-5,0)}$

$\overset{x\ y_1}{(-3,2)}$ $\quad$ $\overset{x\ y_2}{(-3,-2)}$

$$H(\overset{x}{0}, \overset{y}{0}) = \begin{vmatrix} 30 & \\ & \end{vmatrix}$$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x, y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{0}, \overset{y}{0}) = \begin{vmatrix} 30 & 0 \\ & \end{vmatrix}$$

Stacionarne točke

$\overset{x_1\ y}{(0, 0)}$	$\overset{x_2\ y}{(-5, 0)}$
$\overset{x\ y_1}{(-3, 2)}$	$\overset{x\ y_2}{(-3, -2)}$

$$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$$

$$f_{xx} = 12x + 30$$

$$f_{xy} = 18y$$

$$f_{yy} = 18x + 54$$

$$H(x, y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{0}, \overset{y}{0}) = \begin{vmatrix} 30 & 0 \\ 0 & \end{vmatrix}$$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{0}, \overset{y}{0}) = \begin{vmatrix} 30 & 0 \\ 0 & 54 \end{vmatrix}$$

$f_x = 6x^2 + 9y^2 + 30x$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

Stacionarne točke

$\overset{x_1}{(0}, \overset{y}{0)}$ $(\overset{x_2}{-5}, \overset{y}{0})$

$(\overset{x}{-3}, \overset{y_1}{2})$ $(\overset{x}{-3}, \overset{y_2}{-2})$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

$$H(\overset{x}{0}, \overset{y}{0}) = \begin{vmatrix} 30 & 0 \\ 0 & 54 \end{vmatrix} = 1620$$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x, y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

Stacionarne točke

$x_1 \; y$	$x_2 \; y$
$(0, 0)$	$(-5, 0)$
$x \; y_1$	$x \; y_2$
$(-3, 2)$	$(-3, -2)$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{0}, \overset{y}{0}) = \begin{vmatrix} 30 & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0$$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x, y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

Stacionarne točke

x_1 y	x_2 y
$(0, 0)$	$(-5, 0)$
x y_1	x y_2
$(-3, 2)$	$(-3, -2)$

$$H(-3, 2) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(-3, -2) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(0, 0) = \begin{vmatrix} \boxed{30} & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0$$

$30 > 0$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{0}, \overset{y}{0}) = \begin{vmatrix} \boxed{30} & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0$$

($30 > 0$)

→ lokalni minimum

Stacionarne točke

$\overset{x_1\ y}{(0,0)}$	$\overset{x_2\ y}{(-5,0)}$
$\overset{x\ y_1}{(-3,2)}$	$\overset{x\ y_2}{(-3,-2)}$

$$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$$

$$f_{xx} = 12x + 30$$
$$f_{xy} = 18y$$
$$f_{yy} = 18x + 54$$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

Stacionarne točke

$(0,0)$ (x_1, y), $(-5,0)$ (x_2, y), $(-3,2)$ (x, y_1), $(-3,-2)$ (x, y_2)

$$H(-3,2) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

$$H(-3,-2) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

$$H(0,0) = \begin{vmatrix} 30 & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0$$ ($30 > 0$) → lokalni minimum

$f(0,0) =$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

Stacionarne točke

$x_1 \; y$: $(0,0)$ $\qquad$ $x_2 \; y$: $(-5,0)$

$x \; y_1$: $(-3,2)$ $\qquad$ $x \; y_2$: $(-3,-2)$

$$H(-3,2) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(-3,-2) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(0,0) = \begin{vmatrix} 30 & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0$$

$30 > 0$

→ lokalni minimum

$f(0,0) =$

$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

Stacionarne točke

x_1 y	x_2 y
$(0,0)$	$(-5,0)$
x y_1	x y_2
$(-3,2)$	$(-3,-2)$

$$H(\overset{x}{-3},\overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3},\overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{0},\overset{y}{0}) = \begin{vmatrix} 30 & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0$$

$30 > 0$

$f(0,0) = 0$ → lokalni minimum

$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

Stacionarne točke

$\overset{x_1\ y}{(0,0)}$ $\quad$ $\overset{x_2\ \ y}{(-5,0)}$

$\overset{x\ \ y_1}{(-3,2)}$ $\quad$ $\overset{x\ \ \ y_2}{(-3,-2)}$

$$H(\overset{x}{-3},\overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

$$H(\overset{x}{-3},\overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

$$H(\overset{x}{0},\overset{y}{0}) = \begin{vmatrix} \boxed{30} & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0 \qquad H(-5,0) =$$

$30 > 0$

$f(0,0) = 0$ $\qquad$ lokalni minimum

$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2$

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$f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

$$H(-3,2) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

sedlasta točka

$$H(-3,-2) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

sedlasta točka

Stacionarne točke

$(0,0)$ (x_1, y)	$(-5,0)$ (x_2, y)
$(-3,2)$ (x, y_1)	$(-3,-2)$ (x, y_2)

$$H(0,0) = \begin{vmatrix} 30 & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0 \qquad H(-5,0) =$$

$30 > 0$

$f(0,0) = 0$ lokalni minimum

$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2$

$f_x = 6x^2 + 9y^2 + 30x$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

$$H(-3,2) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

$$H(-3,-2) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

Stacionarne točke

$(0,0)$	$(-5,0)$
$(-3,2)$	$(-3,-2)$

$$H(0,0) = \begin{vmatrix} 30 & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0$$ ($30 > 0$) → lokalni minimum

$$H(-5,0) = \begin{vmatrix} & \\ & \end{vmatrix}$$

$f(0,0) = 0$ lokalni minimum

$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2$

$$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$$

$$f_{xx} = 12x + 30$$
$$f_{xy} = 18y$$
$$f_{yy} = 18x + 54$$

$$H(x, y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

Stacionarne točke

$(\overset{x_1}{0}, \overset{y}{0})$	$(\overset{x_2}{-5}, \overset{y}{0})$
$(\overset{x}{-3}, \overset{y_1}{2})$	$(\overset{x}{-3}, \overset{y_2}{-2})$

$$H(\overset{x}{0}, \overset{y}{0}) = \begin{vmatrix} \boxed{30} & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0 \qquad (30 > 0)$$

$$H(\overset{x}{-5}, \overset{y}{0}) = \begin{vmatrix} -30 & \\ & \end{vmatrix}$$

$f(0, 0) = 0$ lokalni minimum

$$f(x, y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2$$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

Stacionarne točke

x_1 y	x_2 y
$(0,0)$	$(-5,0)$
x y_1	x y_2
$(-3,2)$	$(-3,-2)$

$$H(\overset{x}{-3},\overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3},\overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{0},\overset{y}{0}) = \begin{vmatrix} \boxed{30} & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0 \qquad (30 > 0)$$

$$H(\overset{x}{-5},\overset{y}{0}) = \begin{vmatrix} -30 & 0 \\ & \end{vmatrix}$$

$f(0,0) = 0$ → lokalni minimum

$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2$

$$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$$

$$f_{xx} = 12x + 30$$
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$$f_{yy} = 18x + 54$$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

Stacionarne točke

x_1 y	x_2 y
$(0,0)$	$(-5,0)$
x y_1	x y_2
$(-3,2)$	$(-3,-2)$

$$H(-3,2) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

$$H(-3,-2) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

$$H(0,0) = \begin{vmatrix} 30 & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0$$ ($30 > 0$) → lokalni minimum

$$f(0,0) = 0$$

$$H(-5,0) = \begin{vmatrix} -30 & 0 \\ 0 & \end{vmatrix}$$

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2$$

$$f_x = 6x^2 + 9y^2 + 30x$$ $$f_y = 18xy + 54y$$

$$f_{xx} = 12x + 30$$
$$f_{xy} = 18y$$
$$f_{yy} = 18x + 54$$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

Stacionarne točke

x_1 y	x_2 y
$(0,0)$	$(-5,0)$
x y_1	**x y_2**
$(-3,2)$	$(-3,-2)$

$$H(-3,2) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

$$H(-3,-2) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$ → sedlasta točka

$$H(0,0) = \begin{vmatrix} 30 & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0$$ ($30 > 0$) → lokalni minimum

$$H(-5,0) = \begin{vmatrix} -30 & 0 \\ 0 & -36 \end{vmatrix}$$

$f(0,0) = 0$ lokalni minimum

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2$$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

Stacionarne točke

x_1 y	x_2 y
$(0,0)$	$(-5,0)$
x y_1	x y_2
$(-3,2)$	$(-3,-2)$

$$H(\overset{x}{-3}, \overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3}, \overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{0}, \overset{y}{0}) = \begin{vmatrix} \boxed{30} & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0$$

($30 > 0$) → lokalni minimum

$f(0,0) = 0$

$$H(\overset{x}{-5}, \overset{y}{0}) = \begin{vmatrix} -30 & 0 \\ 0 & -36 \end{vmatrix} = 1080$$

$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2$

$f_x = 6x^2 + 9y^2 + 30x$ $\qquad$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x, y) = \begin{vmatrix} 12x + 30 & 18y \\ 18y & 18x + 54 \end{vmatrix}$$

Stacionarne točke

x_1 y: $(0, 0)$ $\qquad$ x_2 y: $(-5, 0)$

x y_1: $(-3, 2)$ $\qquad$ x y_2: $(-3, -2)$

$$H(-3, 2) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(-3, -2) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(0, 0) = \begin{vmatrix} 30 & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0$$

($30 > 0$)

$$H(-5, 0) = \begin{vmatrix} -30 & 0 \\ 0 & -36 \end{vmatrix} = 1080 > 0$$

$f(0, 0) = 0$ $\qquad$ lokalni minimum

$f(x, y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2$

$f_x = 6x^2 + 9y^2 + 30x$

$f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

Stacionarne točke

x_1 y	x_2 y
$(0,0)$	$(-5,0)$
x y_1	x y_2
$(-3,2)$	$(-3,-2)$

$$H(\overset{x}{-3},\overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

sedlasta točka

$$H(\overset{x}{-3},\overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

sedlasta točka

$$H(\overset{x}{0},\overset{y}{0}) = \begin{vmatrix} \boxed{30} & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0 \qquad (30 > 0)$$

$$H(\overset{x}{-5},\overset{y}{0}) = \begin{vmatrix} \boxed{-30} & 0 \\ 0 & -36 \end{vmatrix} = 1080 > 0 \qquad (-30 < 0)$$

$f(0,0) = 0$ lokalni minimum

$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2$

$$f_x = 6x^2 + 9y^2 + 30x \qquad f_y = 18xy + 54y$$

$$f_{xx} = 12x + 30$$
$$f_{xy} = 18y$$
$$f_{yy} = 18x + 54$$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

Stacionarne točke

$\overset{x_1}{}\ \overset{y}{}$ $(0,0)$ $\qquad$ $\overset{x_2}{}\ \overset{y}{}$ $(-5,0)$

$\overset{x}{}\ \overset{y_1}{}$ $(-3,2)$ $\qquad$ $\overset{x}{}\ \overset{y_2}{}$ $(-3,-2)$

$$H(\overset{x}{-3},\overset{y}{2}) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{-3},\overset{y}{-2}) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(\overset{x}{0},\overset{y}{0}) = \begin{vmatrix} \boxed{30} & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0 \qquad (30 > 0)$$

→ lokalni minimum

$$f(0,0) = 0$$

$$H(\overset{x}{-5},\overset{y}{0}) = \begin{vmatrix} \boxed{-30} & 0 \\ 0 & -36 \end{vmatrix} = 1080 > 0 \qquad (-30 < 0)$$

→ lokalni maksimum

$$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2$$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

Stacionarne točke

$(0,0)$, $(-5,0)$, $(-3,2)$, $(-3,-2)$

$$H(-3,2) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

sedlasta točka

$$H(-3,-2) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

sedlasta točka

$$H(0,0) = \begin{vmatrix} 30 & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0$$

$30 > 0$ — lokalni minimum

$f(0,0) = 0$

$$H(-5,0) = \begin{vmatrix} -30 & 0 \\ 0 & -36 \end{vmatrix} = 1080 > 0$$

$-30 < 0$ — lokalni maksimum

$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2$

$f(-5,0) =$

$f_x = 6x^2 + 9y^2 + 30x$ $\quad$ $f_y = 18xy + 54y$

$f_{xx} = 12x + 30$

$f_{xy} = 18y$

$f_{yy} = 18x + 54$

$$H(x,y) = \begin{vmatrix} 12x+30 & 18y \\ 18y & 18x+54 \end{vmatrix}$$

Stacionarne točke

(x_1, y): $(0,0)$ $\quad$ (x_2, y): $(-5,0)$

(x, y_1): $(-3,2)$ $\quad$ (x, y_2): $(-3,-2)$

$$H(-3,2) = \begin{vmatrix} -6 & 36 \\ 36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(-3,-2) = \begin{vmatrix} -6 & -36 \\ -36 & 0 \end{vmatrix} = -1296 < 0$$

→ sedlasta točka

$$H(0,0) = \begin{vmatrix} 30 & 0 \\ 0 & 54 \end{vmatrix} = 1620 > 0 \quad (30 > 0)$$

→ lokalni minimum

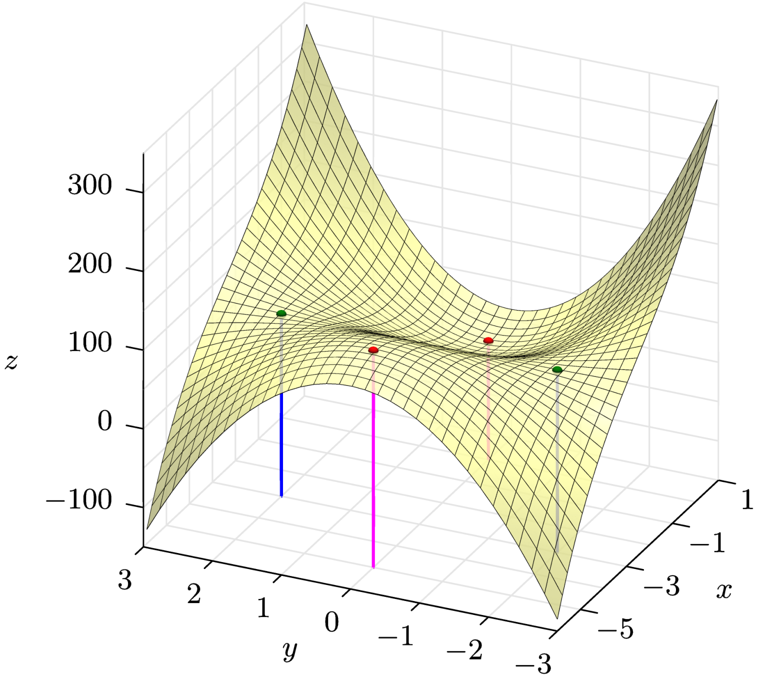
$f(0,0) = 0$

$$H(-5,0) = \begin{vmatrix} -30 & 0 \\ 0 & -36 \end{vmatrix} = 1080 > 0 \quad (-30 < 0)$$

→ lokalni maksimum

$f(-5,0) = 125$

$f(x,y) = 2x^3 + 9xy^2 + 15x^2 + 27y^2$



300
200
100
0
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z
3
2
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0
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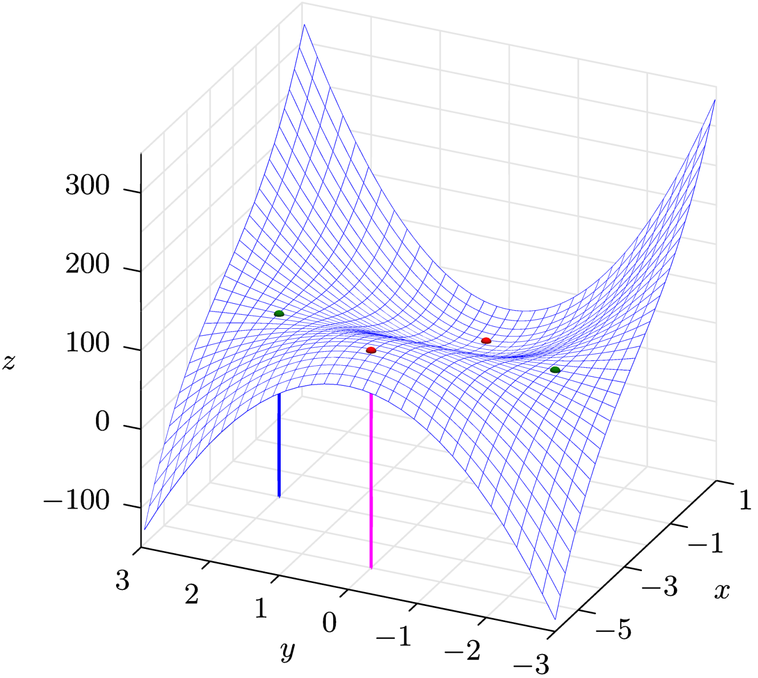
−2
−3
y
1
−1
−3
−5
x


300
200
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3
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−1
−2
−3
y
1
−1
−3
−5
x

treći zadatak

Zadatak 3

Odredite lokalne ekstreme funkcije $f(x, y) = 2x + 3y$ *uz uvjet* $xy = 2$.

Zadatak 3

Odredite lokalne ekstreme funkcije $f(x, y) = 2x + 3y$ *uz uvjet* $xy = 2$.

Rješenje

$$xy = 2$$

Zadatak 3

Odredite lokalne ekstreme funkcije $f(x, y) = 2x + 3y$ *uz uvjet* $xy = 2$.

Rješenje

$$xy = 2 \longrightarrow xy - 2 = 0$$

Zadatak 3

Odredite lokalne ekstreme funkcije $f(x, y) = 2x + 3y$ *uz uvjet* $xy = 2$.

Rješenje

$$xy = 2 \longrightarrow xy - 2 = 0$$

- Lagrangeova funkcija

Zadatak 3

Odredite lokalne ekstreme funkcije $f(x, y) = 2x + 3y$ *uz uvjet* $xy = 2$.

Rješenje

$$xy = 2 \longrightarrow xy - 2 = 0$$

- Lagrangeova funkcija

$$L(x, y, \lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

Zadatak 3

Odredite lokalne ekstreme funkcije $f(x,y) = \boxed{2x+3y}$ *uz uvjet* $xy = 2$.

funkcija

Rješenje

$xy = 2 \longrightarrow xy - 2 = 0$

- Lagrangeova funkcija

$$L(x,y,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

Zadatak 3

Odredite lokalne ekstreme funkcije $f(x,y) = \boxed{2x+3y}$ *uz uvjet* $xy = 2$.

funkcija

Rješenje

$xy = 2 \longrightarrow \boxed{xy-2} = 0$

uvjet

- Lagrangeova funkcija

$$L(x,y,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

Zadatak 3

Odredite lokalne ekstreme funkcije $f(x,y) = \boxed{2x + 3y}$ *uz uvjet* $xy = 2$.

funkcija

Rješenje

$xy = 2 \longrightarrow \boxed{xy - 2} = 0$

uvjet

- Lagrangeova funkcija

$$L(x,y,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,\lambda) = 2x + 3y + \lambda\big(xy - 2\big)$$

Zadatak 3

Odredite lokalne ekstreme funkcije $f(x,y) = \boxed{2x+3y}$ *uz uvjet* $xy = 2$.

funkcija

Rješenje

$xy = 2 \longrightarrow \boxed{xy-2} = 0$

uvjet

- Lagrangeova funkcija

$$L(x,y,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,\lambda) = 2x + 3y + \lambda\big(xy - 2\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x =$$

Zadatak 3

Odredite lokalne ekstreme funkcije $f(x,y) = \boxed{2x + 3y}$ *uz uvjet* $xy = 2$.

funkcija

Rješenje

$xy = 2 \longrightarrow \boxed{xy - 2} = 0$

uvjet

- Lagrangeova funkcija

$$L(x,y,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,\lambda) = 2x + 3y + \lambda\big(xy - 2\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2 + \lambda y$$

Zadatak 3

Odredite lokalne ekstreme funkcije $f(x,y) = \boxed{2x+3y}$ *uz uvjet* $xy = 2$.

funkcija

Rješenje

$xy = 2 \longrightarrow \boxed{xy-2} = 0$

uvjet

- Lagrangeova funkcija

$$L(x,y,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,\lambda) = 2x + 3y + \lambda\big(xy - 2\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2 + \lambda y$$

$$L_y =$$

Zadatak 3

Odredite lokalne ekstreme funkcije $f(x,y) = \boxed{2x + 3y}$ *uz uvjet* $xy = 2$.

funkcija

Rješenje

$xy = 2 \longrightarrow \boxed{xy - 2} = 0$

uvjet

- Lagrangeova funkcija

$$L(x,y,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,\lambda) = 2x + 3y + \lambda\big(xy - 2\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2 + \lambda y$$

$$L_y = 3 + \lambda x$$

Zadatak 3

Odredite lokalne ekstreme funkcije $f(x, y) = \boxed{2x + 3y}$ *uz uvjet* $xy = 2$.

funkcija

Rješenje

$xy = 2 \longrightarrow \boxed{xy - 2} = 0$

uvjet

- Lagrangeova funkcija

$$L(x, y, \lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x, y, \lambda) = 2x + 3y + \lambda\big(xy - 2\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2 + \lambda y$$

$$L_y = 3 + \lambda x$$

$$L_\lambda =$$

Zadatak 3

Odredite lokalne ekstreme funkcije $f(x, y) = \boxed{2x + 3y}$ *uz uvjet* $xy = 2$.

funkcija

Rješenje

$$xy = 2 \longrightarrow \boxed{xy - 2} = 0$$

uvjet

- Lagrangeova funkcija

$$L(x, y, \lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x, y, \lambda) = 2x + 3y + \lambda\big(xy - 2\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2 + \lambda y$$

$$L_y = 3 + \lambda x$$

$$L_\lambda = xy - 2$$

Zadatak 3

Odredite lokalne ekstreme funkcije $f(x, y) = \boxed{2x + 3y}$ *uz uvjet* $xy = 2$.

funkcija

Rješenje

$$xy = 2 \longrightarrow \boxed{xy - 2} = 0$$

uvjet

- Lagrangeova funkcija

$$L(x, y, \lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x, y, \lambda) = 2x + 3y + \lambda\big(xy - 2\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2 + \lambda y \qquad 2 + \lambda y = 0$$

$$L_y = 3 + \lambda x \qquad 3 + \lambda x = 0$$

$$L_\lambda = xy - 2 \qquad xy - 2 = 0$$

$$
\begin{aligned}
2 + \lambda y &= 0 \\
3 + \lambda x &= 0 \\
xy - 2 &= 0
\end{aligned}
$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2$$
$$3 + \lambda x = 0$$
$$xy - 2 = 0$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \longrightarrow \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0$$

$$xy - 2 = 0$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \longrightarrow \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0 \longrightarrow \lambda x = -3$$

$$xy - 2 = 0$$

$$
\begin{aligned}
2 + \lambda y &= 0 \longrightarrow \lambda y = -2 \rightarrow \lambda = -\frac{2}{y} \\
3 + \lambda x &= 0 \longrightarrow \lambda x = -3 \rightarrow \lambda = -\frac{3}{x} \\
xy - 2 &= 0
\end{aligned}
$$

$$\begin{aligned} 2 + \lambda y &= 0 \longrightarrow \lambda y = -2 \rightarrow \lambda = -\frac{2}{y} \\ 3 + \lambda x &= 0 \longrightarrow \lambda x = -3 \rightarrow \lambda = -\frac{3}{x} \\ xy - 2 &= 0 \end{aligned}$$

$$\left.\begin{aligned} \lambda &= -\frac{2}{y} \\ \lambda &= -\frac{3}{x} \end{aligned}\right\} \Longrightarrow \quad -\frac{2}{y} = -\frac{3}{x}$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \longrightarrow \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0 \longrightarrow \lambda x = -3 \longrightarrow \lambda = -\frac{3}{x}$$

$$xy - 2 = 0$$

$$\left.\begin{array}{l} \lambda = -\frac{2}{y} \\ \lambda = -\frac{3}{x} \end{array}\right\} \Longrightarrow \begin{array}{c} -\frac{2}{y} = -\frac{3}{x} \\ 3y = 2x \end{array}$$

$$
\begin{aligned}
2 + \lambda y &= 0 \longrightarrow \lambda y = -2 \to \lambda = -\frac{2}{y} \\
3 + \lambda x &= 0 \longrightarrow \lambda x = -3 \to \lambda = -\frac{3}{x} \\
xy - 2 &= 0
\end{aligned}
\qquad \Longrightarrow \qquad
\begin{aligned}
-\frac{2}{y} &= -\frac{3}{x} \\
3y &= 2x \\
y &= \frac{2}{3}x
\end{aligned}
$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \longrightarrow \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0 \longrightarrow \lambda x = -3 \longrightarrow \lambda = -\frac{3}{x}$$

$$xy - 2 = 0$$

$$\left.\begin{aligned} \lambda &= -\frac{2}{y} \\ \lambda &= -\frac{3}{x} \end{aligned}\right\} \Longrightarrow -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$\boxed{y = \frac{2}{3}x}$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \rightarrow \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0 \longrightarrow \lambda x = -3 \rightarrow \lambda = -\frac{3}{x}$$

$$\left.\begin{matrix} \lambda = -\frac{2}{y} \\ \lambda = -\frac{3}{x} \end{matrix}\right\} \implies -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$\boxed{y = \frac{2}{3}x}$$

$$xy - 2 = 0 \leftarrow y = \frac{2}{3}x$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \to \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0 \longrightarrow \lambda x = -3 \to \lambda = -\frac{3}{x}$$

$$\left.\begin{array}{l} \lambda = -\frac{2}{y} \\ \lambda = -\frac{3}{x} \end{array}\right\} \Longrightarrow -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$\boxed{y = \frac{2}{3}x}$$

$$xy - 2 = 0$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \longrightarrow \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0 \longrightarrow \lambda x = -3 \longrightarrow \lambda = -\frac{3}{x}$$

$$\left.\begin{array}{l} \lambda = -\frac{2}{y} \\ \lambda = -\frac{3}{x} \end{array}\right\} \implies -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$\boxed{y = \frac{2}{3}x}$$

$$xy - 2 = 0$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \rightarrow \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0 \longrightarrow \lambda x = -3 \rightarrow \lambda = -\frac{3}{x}$$

$$\left.\begin{matrix} \lambda = -\frac{2}{y} \\ \lambda = -\frac{3}{x} \end{matrix}\right\} \Longrightarrow -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$\boxed{y = \frac{2}{3}x}$$

$$xy - 2 = 0$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2 \Big/ \cdot \frac{3}{2}$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \longrightarrow \lambda = -\frac{2}{y}$$

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$$xy - 2 = 0$$

$$\left.\begin{array}{l} \lambda = -\frac{2}{y} \\ \lambda = -\frac{3}{x} \end{array}\right\} \implies -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$\boxed{y = \frac{2}{3}x}$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2 \quad / \cdot \frac{3}{2}$$

$$x^2 = 3$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \rightarrow \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0 \longrightarrow \lambda x = -3 \rightarrow \lambda = -\frac{3}{x}$$

$$\left.\begin{aligned} \lambda &= -\frac{2}{y} \\ \lambda &= -\frac{3}{x} \end{aligned}\right\} \Longrightarrow \quad -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$\boxed{y = \frac{2}{3}x}$$

$$xy - 2 = 0$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2 \Big/ \cdot \frac{3}{2}$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \longrightarrow \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0 \longrightarrow \lambda x = -3 \longrightarrow \lambda = -\frac{3}{x}$$

$$\implies -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$\boxed{y = \frac{2}{3}x}$$

$$xy - 2 = 0$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2 \quad / \cdot \frac{3}{2}$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$y_1 = \frac{2}{3}\sqrt{3}$$

$$
\begin{aligned}
2 + \lambda y &= 0 \longrightarrow \lambda y = -2 \rightarrow \lambda = -\frac{2}{y} \\
3 + \lambda x &= 0 \longrightarrow \lambda x = -3 \rightarrow \lambda = -\frac{3}{x} \\
xy - 2 &= 0
\end{aligned}
\quad \Longrightarrow \quad -\frac{2}{y} = -\frac{3}{x}, \quad 3y = 2x, \quad \boxed{y = \frac{2}{3}x}
$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2 \quad \Big/ \cdot \frac{3}{2}$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$y_1 = \frac{2}{3}\sqrt{3}, \quad y_2 = -\frac{2}{3}\sqrt{3}$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \longrightarrow \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0 \longrightarrow \lambda x = -3 \longrightarrow \lambda = -\frac{3}{x}$$

$$\left.\begin{array}{l} \lambda = -\frac{2}{y} \\ \lambda = -\frac{3}{x} \end{array}\right\} \Longrightarrow -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$\boxed{y = \frac{2}{3}x}$$

$$xy - 2 = 0$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2 \quad \Big/ \cdot \frac{3}{2}$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$y_1 = \frac{2}{3}\sqrt{3}, \quad y_2 = -\frac{2}{3}\sqrt{3}$$

$$\lambda_1 = -\frac{3}{x_1}$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \rightarrow \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0 \longrightarrow \lambda x = -3 \rightarrow \lambda = -\frac{3}{x}$$

$$xy - 2 = 0$$

$$\left.\begin{array}{l} \lambda = -\frac{2}{y} \\ \lambda = -\frac{3}{x} \end{array}\right\} \Longrightarrow -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$\boxed{y = \frac{2}{3}x}$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2 \quad / \cdot \frac{3}{2}$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$y_1 = \frac{2}{3}\sqrt{3}, \quad y_2 = -\frac{2}{3}\sqrt{3}$$

$$\lambda_1 = -\frac{3}{x_1} = -\frac{3}{\sqrt{3}}$$

$$
\begin{aligned}
2+\lambda y &= 0 \longrightarrow \lambda y = -2 \longrightarrow \lambda = -\frac{2}{y} \\
3+\lambda x &= 0 \longrightarrow \lambda x = -3 \longrightarrow \lambda = -\frac{3}{x} \\
xy - 2 &= 0
\end{aligned}
$$

$$
\left.\begin{aligned} \lambda &= -\frac{2}{y} \\ \lambda &= -\frac{3}{x} \end{aligned}\right\} \Longrightarrow \quad -\frac{2}{y} = -\frac{3}{x}
$$

$$
3y = 2x
$$

$$
\boxed{y = \frac{2}{3}x}
$$

$$
x \cdot \frac{2}{3}x - 2 = 0
$$

$$
\frac{2}{3}x^2 = 2 \;\Big/ \cdot \frac{3}{2}
$$

$$
x^2 = 3
$$

$$
x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}
$$

$$
y_1 = \frac{2}{3}\sqrt{3}, \quad y_2 = -\frac{2}{3}\sqrt{3}
$$

$$
\lambda_1 = -\frac{3}{x_1} = -\frac{3}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}
$$

$$
\begin{aligned}
2 + \lambda y &= 0 \longrightarrow \lambda y = -2 \rightarrow \lambda = -\frac{2}{y} \\
3 + \lambda x &= 0 \longrightarrow \lambda x = -3 \rightarrow \lambda = -\frac{3}{x} \\
xy - 2 &= 0
\end{aligned}
$$

$$\Longrightarrow \quad -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$\boxed{y = \frac{2}{3}x}$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2 \quad \Big/ \cdot \frac{3}{2}$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$y_1 = \frac{2}{3}\sqrt{3}, \quad y_2 = -\frac{2}{3}\sqrt{3}$$

$$\lambda_1 = -\frac{3}{x_1} = -\frac{3}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = -\sqrt{3}$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \longrightarrow \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0 \longrightarrow \lambda x = -3 \longrightarrow \lambda = -\frac{3}{x}$$

$$\left.\begin{array}{l} \lambda = -\frac{2}{y} \\ \lambda = -\frac{3}{x} \end{array}\right\} \Longrightarrow -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$\boxed{y = \frac{2}{3}x}$$

$$xy - 2 = 0$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2 \quad \Big/ \cdot \frac{3}{2}$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$y_1 = \frac{2}{3}\sqrt{3}, \quad y_2 = -\frac{2}{3}\sqrt{3}$$

$$\lambda_1 = -\frac{3}{x_1} = -\frac{3}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = -\sqrt{3}$$

$$\lambda_2 = -\frac{3}{x_2}$$

$$
\begin{aligned}
2 + \lambda y &= 0 \longrightarrow \lambda y = -2 \rightarrow \lambda = -\frac{2}{y} \\
3 + \lambda x &= 0 \longrightarrow \lambda x = -3 \rightarrow \lambda = -\frac{3}{x} \\
xy - 2 &= 0
\end{aligned}
\quad \Longrightarrow \quad -\frac{2}{y} = -\frac{3}{x}, \quad 3y = 2x, \quad \boxed{y = \frac{2}{3}x}
$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2 \quad \Big/ \cdot \frac{3}{2}$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$y_1 = \frac{2}{3}\sqrt{3}, \quad y_2 = -\frac{2}{3}\sqrt{3}$$

$$\lambda_1 = -\frac{3}{x_1} = -\frac{3}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = -\sqrt{3}$$

$$\lambda_2 = -\frac{3}{x_2} = -\frac{3}{-\sqrt{3}}$$

$$\begin{aligned} 2 + \lambda y &= 0 \longrightarrow \lambda y = -2 \longrightarrow \lambda = -\frac{2}{y} \\ 3 + \lambda x &= 0 \longrightarrow \lambda x = -3 \longrightarrow \lambda = -\frac{3}{x} \\ xy - 2 &= 0 \end{aligned} \quad \Longrightarrow \quad -\frac{2}{y} = -\frac{3}{x}, \quad 3y = 2x, \quad \boxed{y = \frac{2}{3}x}$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2 \;\Big/ \cdot \frac{3}{2}$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$y_1 = \frac{2}{3}\sqrt{3}, \quad y_2 = -\frac{2}{3}\sqrt{3}$$

$$\lambda_1 = -\frac{3}{x_1} = -\frac{3}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = -\sqrt{3}$$

$$\lambda_2 = -\frac{3}{x_2} = -\frac{3}{-\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

$$
\left.\begin{array}{l}
2+\lambda y=0 \longrightarrow \lambda y=-2 \longrightarrow \lambda=-\dfrac{2}{y} \\
3+\lambda x=0 \longrightarrow \lambda x=-3 \longrightarrow \lambda=-\dfrac{3}{x} \\
xy-2=0
\end{array}\right\} \Longrightarrow -\frac{2}{y}=-\frac{3}{x}
$$

$$3y=2x$$

$$\boxed{y=\frac{2}{3}x}$$

$$x\cdot\frac{2}{3}x-2=0$$

$$\frac{2}{3}x^2=2 \;\Big/ \cdot \frac{3}{2}$$

$$x^2=3$$

$$x_1=\sqrt{3}, \quad x_2=-\sqrt{3}$$

$$y_1=\frac{2}{3}\sqrt{3}, \quad y_2=-\frac{2}{3}\sqrt{3}$$

$$\lambda_1=-\frac{3}{x_1}=-\frac{3}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}}=-\sqrt{3}$$

$$\lambda_2=-\frac{3}{x_2}=-\frac{3}{-\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}}=\sqrt{3}$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \longrightarrow \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0 \longrightarrow \lambda x = -3 \longrightarrow \lambda = -\frac{3}{x}$$

$$\left.\begin{array}{l} \lambda = -\frac{2}{y} \\ \lambda = -\frac{3}{x} \end{array}\right\} \Longrightarrow -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$\boxed{y = \frac{2}{3}x}$$

$$xy - 2 = 0$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2 \Big/ \cdot \frac{3}{2}$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$y_1 = \frac{2}{3}\sqrt{3}, \quad y_2 = -\frac{2}{3}\sqrt{3}$$

$$\lambda_1 = -\frac{3}{x_1} = -\frac{3}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = -\sqrt{3}$$

$$\lambda_2 = -\frac{3}{x_2} = -\frac{3}{-\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \sqrt{3}$$

Stacionarne točke

$$\begin{aligned} 2+\lambda y &= 0 \longrightarrow \lambda y = -2 \longrightarrow \lambda = -\frac{2}{y} \\ 3+\lambda x &= 0 \longrightarrow \lambda x = -3 \longrightarrow \lambda = -\frac{3}{x} \\ xy-2 &= 0 \end{aligned}$$

$$\left.\begin{aligned}\lambda &= -\frac{2}{y}\\ \lambda &= -\frac{3}{x}\end{aligned}\right\} \Longrightarrow -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$\boxed{y = \frac{2}{3}x}$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2 \quad \Big/ \cdot \frac{3}{2}$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$y_1 = \frac{2}{3}\sqrt{3}, \quad y_2 = -\frac{2}{3}\sqrt{3}$$

$$\lambda_1 = -\frac{3}{x_1} = -\frac{3}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = -\sqrt{3}$$

$$\lambda_2 = -\frac{3}{x_2} = -\frac{3}{-\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \sqrt{3}$$

Stacionarne točke

$$\left(\sqrt{3},\ \frac{2}{3}\sqrt{3},\ -\sqrt{3}\right)$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \longrightarrow \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0 \longrightarrow \lambda x = -3 \longrightarrow \lambda = -\frac{3}{x}$$

$$\Longrightarrow \quad -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$y = \frac{2}{3}x$$

$$xy - 2 = 0$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2 \quad \Big/ \cdot \frac{3}{2}$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$y_1 = \frac{2}{3}\sqrt{3}, \quad y_2 = -\frac{2}{3}\sqrt{3}$$

$$\lambda_1 = -\frac{3}{x_1} = -\frac{3}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = -\sqrt{3}$$

$$\lambda_2 = -\frac{3}{x_2} = -\frac{3}{-\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \sqrt{3}$$

Stacionarne točke

$$\left(\overset{x_1}{\sqrt{3}},\ \overset{y_1}{\frac{2}{3}\sqrt{3}},\ \overset{\lambda_1}{-\sqrt{3}}\right)$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \longrightarrow \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0 \longrightarrow \lambda x = -3 \longrightarrow \lambda = -\frac{3}{x}$$

$$xy - 2 = 0$$

$$\Longrightarrow \quad -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$\boxed{y = \frac{2}{3}x}$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2 \quad \Big/ \cdot \frac{3}{2}$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$y_1 = \frac{2}{3}\sqrt{3}, \quad y_2 = -\frac{2}{3}\sqrt{3}$$

$$\lambda_1 = -\frac{3}{x_1} = -\frac{3}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = -\sqrt{3}$$

$$\lambda_2 = -\frac{3}{x_2} = -\frac{3}{-\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \sqrt{3}$$

Stacionarne točke

$$\left(\overset{x_1}{\sqrt{3}},\ \overset{y_1}{\frac{2}{3}\sqrt{3}},\ \overset{\lambda_1}{-\sqrt{3}}\right)$$

$$\left(-\sqrt{3},\ -\frac{2}{3}\sqrt{3},\ \sqrt{3}\right)$$

$$2 + \lambda y = 0 \longrightarrow \lambda y = -2 \longrightarrow \lambda = -\frac{2}{y}$$

$$3 + \lambda x = 0 \longrightarrow \lambda x = -3 \longrightarrow \lambda = -\frac{3}{x}$$

$$\left.\begin{array}{l} \lambda = -\frac{2}{y} \\ \lambda = -\frac{3}{x} \end{array}\right\} \Longrightarrow -\frac{2}{y} = -\frac{3}{x}$$

$$3y = 2x$$

$$\boxed{y = \frac{2}{3}x}$$

$$xy - 2 = 0$$

$$x \cdot \frac{2}{3}x - 2 = 0$$

$$\frac{2}{3}x^2 = 2 \;\Big/ \cdot \frac{3}{2}$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$y_1 = \frac{2}{3}\sqrt{3}, \quad y_2 = -\frac{2}{3}\sqrt{3}$$

$$\lambda_1 = -\frac{3}{x_1} = -\frac{3}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = -\sqrt{3}$$

$$\lambda_2 = -\frac{3}{x_2} = -\frac{3}{-\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \sqrt{3}$$

Stacionarne točke

$$\left(\overset{x_1}{\sqrt{3}}, \overset{y_1}{\frac{2}{3}\sqrt{3}}, \overset{\lambda_1}{-\sqrt{3}}\right)$$

$$\left(\overset{x_2}{-\sqrt{3}}, \overset{y_2}{-\frac{2}{3}\sqrt{3}}, \overset{\lambda_2}{\sqrt{3}}\right)$$

$$L(x, y, \lambda) = 2x + 3y + \lambda\big(xy - 2\big)$$

$$L_x = 2 + \lambda y$$

$$L_y = 3 + \lambda x$$

$$L(x, y, \lambda) = 2x + 3y + \lambda\big(xy - 2\big)$$

$$L_x = 2 + \lambda y$$

$$L_y = 3 + \lambda x$$

$$\Delta(x, y, \lambda) = \begin{vmatrix} 0 & g_x & g_y \\ g_x & L_{xx} & L_{xy} \\ g_y & L_{xy} & L_{yy} \end{vmatrix}$$

$$L(x, y, \lambda) = 2x + 3y + \lambda\big(xy - 2\big)$$

$$L_x = 2 + \lambda y$$

$$L_y = 3 + \lambda x$$

$$f(x, y) = 2x + 3y$$

$$\Delta(x, y, \lambda) = \begin{vmatrix} 0 & g_x & g_y \\ g_x & L_{xx} & L_{xy} \\ g_y & L_{xy} & L_{yy} \end{vmatrix}$$

$$L(x,y,\lambda) = 2x + 3y + \lambda(xy - 2)$$

$$L_x = 2 + \lambda y$$

$$L_y = 3 + \lambda x$$

$$f(x,y) = 2x + 3y$$

$$g(x,y) = xy - 2$$

$$\Delta(x,y,\lambda) = \begin{vmatrix} 0 & g_x & g_y \\ g_x & L_{xx} & L_{xy} \\ g_y & L_{xy} & L_{yy} \end{vmatrix}$$

$$L(x, y, \lambda) = 2x + 3y + \lambda\big(xy - 2\big)$$

$$L_x = 2 + \lambda y$$

$$L_y = 3 + \lambda x$$

$$f(x, y) = 2x + 3y$$

$$g(x, y) = xy - 2$$

$$g_x =$$

$$\Delta(x, y, \lambda) = \begin{vmatrix} 0 & g_x & g_y \\ g_x & L_{xx} & L_{xy} \\ g_y & L_{xy} & L_{yy} \end{vmatrix}$$

$$L(x, y, \lambda) = 2x + 3y + \lambda\left(xy - 2\right)$$

$$L_x = 2 + \lambda y$$

$$L_y = 3 + \lambda x$$

$$f(x, y) = 2x + 3y$$

$$g(x, y) = xy - 2$$

$$\Delta(x, y, \lambda) = \begin{vmatrix} 0 & g_x & g_y \\ g_x & L_{xx} & L_{xy} \\ g_y & L_{xy} & L_{yy} \end{vmatrix}$$

$$g_x = y$$

$$L(x, y, \lambda) = 2x + 3y + \lambda\big(xy - 2\big)$$

$$L_x = 2 + \lambda y$$

$$L_y = 3 + \lambda x$$

$$f(x, y) = 2x + 3y$$

$$g(x, y) = xy - 2$$

$$g_x = y, \quad g_y =$$

$$\Delta(x, y, \lambda) = \begin{vmatrix} 0 & g_x & g_y \\ g_x & L_{xx} & L_{xy} \\ g_y & L_{xy} & L_{yy} \end{vmatrix}$$

$$L(x,y,\lambda) = 2x + 3y + \lambda\big(xy - 2\big)$$

$$L_x = 2 + \lambda y$$

$$L_y = 3 + \lambda x$$

$$f(x,y) = 2x + 3y$$

$$g(x,y) = xy - 2$$

$$g_x = y, \quad g_y = x$$

$$\Delta(x,y,\lambda) = \begin{vmatrix} 0 & g_x & g_y \\ g_x & L_{xx} & L_{xy} \\ g_y & L_{xy} & L_{yy} \end{vmatrix}$$

$$L(x, y, \lambda) = 2x + 3y + \lambda\big(xy - 2\big)$$ $$L_x = 2 + \lambda y$$ $$L_y = 3 + \lambda x$$

$$f(x, y) = 2x + 3y$$ $$g(x, y) = xy - 2$$

$$g_x = y, \quad g_y = x$$

$$\Delta(x, y, \lambda) = \begin{vmatrix} 0 & g_x & g_y \\ g_x & L_{xx} & L_{xy} \\ g_y & L_{xy} & L_{yy} \end{vmatrix}$$

$$L_{xx} =$$

$$L(x,y,\lambda) = 2x + 3y + \lambda(xy - 2)$$ $$L_x = 2 + \lambda y$$ $$L_y = 3 + \lambda x$$

$$f(x,y) = 2x + 3y$$ $$g(x,y) = xy - 2$$

$$g_x = y, \quad g_y = x$$

$$L_{xx} = 0$$

$$\Delta(x,y,\lambda) = \begin{vmatrix} 0 & g_x & g_y \\ g_x & L_{xx} & L_{xy} \\ g_y & L_{xy} & L_{yy} \end{vmatrix}$$

$$L(x,y,\lambda) = 2x + 3y + \lambda\big(xy - 2\big)$$ $$L_x = 2 + \lambda y$$ $$L_y = 3 + \lambda x$$

$$f(x,y) = 2x + 3y$$ $$g(x,y) = xy - 2$$

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$$L_{xx} = 0, \quad L_{xy} =$$

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→ uvjetni lokalni minimum

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→ uvjetni lokalni minimum

$$f\left(\sqrt{3},\ \tfrac{2}{3}\sqrt{3}\right) =$$

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$$\Delta\Big(\underbrace{\sqrt{3}}_{x},\ \underbrace{\tfrac{2}{3}\sqrt{3}}_{y},\ \underbrace{-\sqrt{3}}_{\lambda}\Big) = \begin{vmatrix} 0 & \frac{2}{3}\sqrt{3} & \sqrt{3} \\ \frac{2}{3}\sqrt{3} & 0 & -\sqrt{3} \\ \sqrt{3} & -\sqrt{3} & 0 \end{vmatrix} = -4\sqrt{3} < 0$$

→ uvjetni lokalni minimum

$$f\left(\sqrt{3},\ \tfrac{2}{3}\sqrt{3}\right) = 4\sqrt{3}$$

$L(x,y,\lambda) = 2x + 3y + \lambda(xy - 2)$ $\quad L_x = 2 + \lambda y$ $\quad L_y = 3 + \lambda x$

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uvjetni lokalni minimum

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→ uvjetni lokalni minimum

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< 0 → uvjetni lokalni minimum

$$f\Big(\sqrt{3},\ \tfrac{2}{3}\sqrt{3}\Big) = 4\sqrt{3}$$

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> 0 → uvjetni lokalni maksimum

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$$\Delta\Big(\overset{x}{\sqrt{3}},\ \overset{y}{\tfrac{2}{3}\sqrt{3}},\ \overset{\lambda}{-\sqrt{3}}\Big) = \begin{vmatrix} 0 & \frac{2}{3}\sqrt{3} & \sqrt{3} \\ \frac{2}{3}\sqrt{3} & 0 & -\sqrt{3} \\ \sqrt{3} & -\sqrt{3} & 0 \end{vmatrix} = -4\sqrt{3} < 0$$

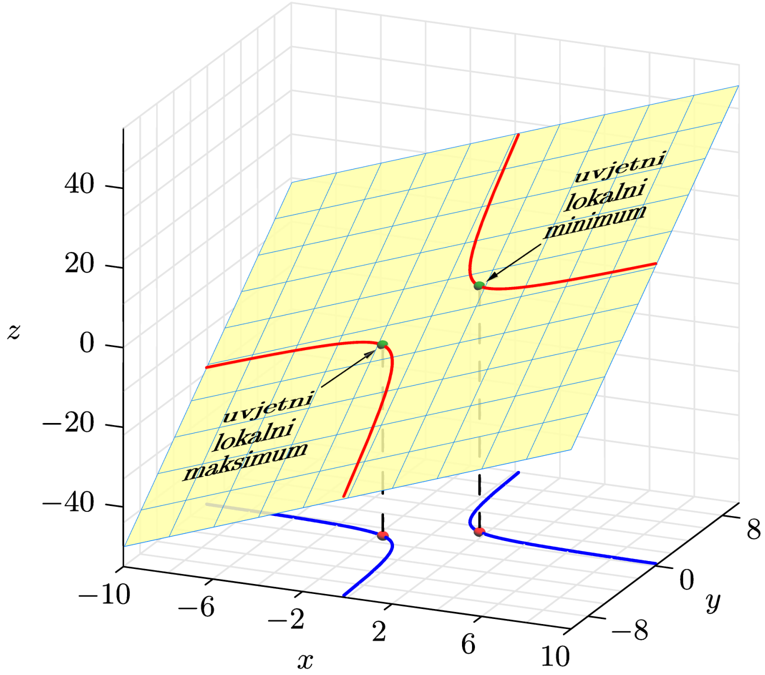
→ uvjetni lokalni minimum

$$f\left(\sqrt{3},\ \tfrac{2}{3}\sqrt{3}\right) = 4\sqrt{3}$$

$$\Delta\Big(\overset{x}{-\sqrt{3}},\ \overset{y}{-\tfrac{2}{3}\sqrt{3}},\ \overset{\lambda}{\sqrt{3}}\Big) = \begin{vmatrix} 0 & -\frac{2}{3}\sqrt{3} & -\sqrt{3} \\ -\frac{2}{3}\sqrt{3} & 0 & \sqrt{3} \\ -\sqrt{3} & \sqrt{3} & 0 \end{vmatrix} = 4\sqrt{3} > 0$$

→ uvjetni lokalni maksimum

$$f\left(-\sqrt{3},\ -\tfrac{2}{3}\sqrt{3}\right) = -4\sqrt{3}$$


uvjetni
lokalni
minimum
uvjetni
lokalni
maksimum
40
20
0
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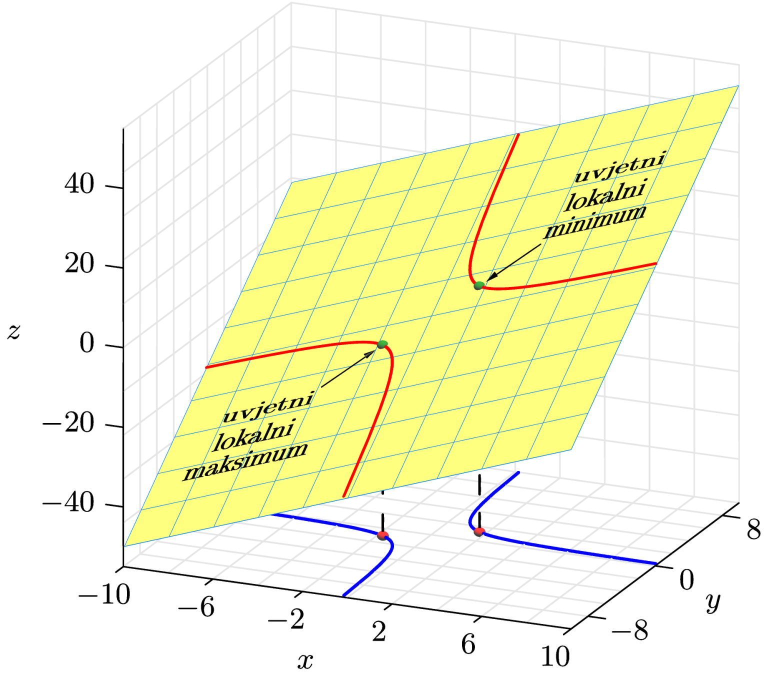
−40
z
−10
−6
−2
2
6
10
x
8
0
−8
y


uvjetni
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−2
2
6
10
x
8
0
−8
y

2. način

$f(x, y) = 2x + 3y$ $\qquad$ $xy = 2$

2. način

$$f(x, y) = 2x + 3y$$

$$xy = 2$$

$$\downarrow$$

$$y = \frac{2}{x}$$

2. način

$$f(x, y) = 2x + 3y$$

$$xy = 2$$

$$\boxed{y = \frac{2}{x}}$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

$$y = \frac{2}{x}$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

$$y = \frac{2}{x}$$

$$f\left(x, \frac{2}{x}\right) =$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

$$\boxed{y = \frac{2}{x}}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x}$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

$$\boxed{y = \frac{2}{x}}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

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$$h(x) = 2x + 6x^{-1}$$

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$$h(x) = 2x + 6x^{-1}$$

$$h'(x) =$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

$$y = \frac{2}{x}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

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$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

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$$2 - 6x^{-2} = 0$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

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$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

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$$2 - 6x^{-2} = 0 \;/\cdot x^2$$

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$$y = \frac{2}{x}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \;/\cdot x^2$$

$$2x^2 - 6 = 0$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

$$\boxed{y = \frac{2}{x}}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \; / \cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

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$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \ / \cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

$$y = \frac{2}{x}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

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$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

$$\boxed{y = \frac{2}{x}}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \;/ \cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$\boxed{x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}}$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

$$y = \frac{2}{x}$$

$$h''(x) =$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \;/\cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

$$y = \frac{2}{x} \qquad h''(x) = 12x^{-3}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \ / \cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

$$\boxed{y = \frac{2}{x}} \qquad h''(x) = 12x^{-3}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1} \qquad h''\left(\sqrt{3}\right) =$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \; / \cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$\boxed{x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}}$$

2. način

$$f(x,y) = 2x + 3y \qquad xy = 2$$

$$y = \frac{2}{x}$$

$$h''(x) = 12x^{-3}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{-3}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \;/\cdot x^2$$

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$$h'(x) = 2 - 6x^{-2}$$

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$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$\boxed{x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}}$$

$$h''(x) = 12x^{-3}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{\,-3} = \frac{4}{\sqrt{3}}$$

2. način

$$f(x,y) = 2x + 3y \qquad xy = 2$$

$$\boxed{y = \frac{2}{x}}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3\cdot\frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \;/\cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$\boxed{x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}}$$

$$h''(x) = 12x^{-3}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{-3} = \frac{4}{\sqrt{3}} > 0$$

2. način

$$f(x,y) = 2x + 3y \qquad xy = 2$$

$$\boxed{y = \frac{2}{x}}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \;/\cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$\boxed{x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}}$$

$$h''(x) = 12x^{-3}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{-3} = \frac{4}{\sqrt{3}} > 0$$

lokalni minimum

2. način

$$f(x,y) = 2x + 3y \qquad xy = 2$$

$$\boxed{y = \frac{2}{x}}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \;/ \cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$\boxed{x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}}$$

$$h''(x) = 12x^{-3}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{-3} = \frac{4}{\sqrt{3}} > 0$$

lokalni minimum

$$h(\sqrt{3}) =$$

2. način

$h(\sqrt{3}) =$

$y = \frac{2}{x}$

$h''(x) = 12x^{-3}$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \;/\cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$\boxed{x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{-3} = \frac{4}{\sqrt{3}} > 0$$

lokalni minimum

$h(\sqrt{3}) =$

2. način

$$h(\sqrt{3}) = 2\sqrt{3} + 6\sqrt{3}^{-1}$$

$y = \frac{2}{x}$

$h''(x) = 12x^{-3}$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \;/ \cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$\boxed{x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{-3} = \frac{4}{\sqrt{3}} > 0$$

lokalni minimum

$$h(\sqrt{3}) =$$

2. način

$$h(\sqrt{3}) = 2\sqrt{3} + 6\sqrt{3}^{\,-1} = 2\sqrt{3} + \frac{6}{\sqrt{3}}$$

$y = \frac{2}{x}$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \;/\cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$h''(x) = 12x^{-3}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{\,-3} = \frac{4}{\sqrt{3}} > 0$$

lokalni minimum

$$h(\sqrt{3}) =$$

2. način

$$h(\sqrt{3}) = 2\sqrt{3} + 6\sqrt{3}^{-1} = 2\sqrt{3} + \frac{6}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

$$y = \frac{2}{x}$$

$$h''(x) = 12x^{-3}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{-3} = \frac{4}{\sqrt{3}} > 0$$

lokalni minimum

$$h(x) = 2x + 6x^{-1}$$

$$h(\sqrt{3}) =$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \; / \cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

2. način

$$h(\sqrt{3}) = 2\sqrt{3} + 6\sqrt{3}^{-1} = 2\sqrt{3} + \frac{6}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = 2\sqrt{3} +$$

$$y = \frac{2}{x}$$

$$h''(x) = 12x^{-3}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{-3} = \frac{4}{\sqrt{3}} > 0$$

lokalni minimum

$$h(\sqrt{3}) =$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \;/\cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

2. način

$$h(\sqrt{3}) = 2\sqrt{3} + 6\sqrt{3}^{-1} = 2\sqrt{3} + \frac{6}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = 2\sqrt{3} + 2\sqrt{3}$$

$$y = \frac{2}{x}$$

$$h''(x) = 12x^{-3}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \;/\cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{-3} = \frac{4}{\sqrt{3}} > 0$$

lokalni minimum

$$h(\sqrt{3}) =$$

2. način

$$h(\sqrt{3}) = 2\sqrt{3} + 6\sqrt{3}^{-1} = 2\sqrt{3} + \frac{6}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = 2\sqrt{3} + 2\sqrt{3} = 4\sqrt{3}$$

$$y = \frac{2}{x}$$

$$h''(x) = 12x^{-3}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \; / \cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{-3} = \frac{4}{\sqrt{3}} > 0$$

lokalni minimum

$$h(\sqrt{3}) =$$

2. način

$$h(\sqrt{3}) = 2\sqrt{3} + 6\sqrt{3}^{-1} = 2\sqrt{3} + \frac{6}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = 2\sqrt{3} + 2\sqrt{3} = 4\sqrt{3}$$

$$y = \frac{2}{x}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \; / \cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$h''(x) = 12x^{-3}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{-3} = \frac{4}{\sqrt{3}} > 0$$

$$h(\sqrt{3}) = 4\sqrt{3}$$

lokalni minimum

2. način

$$f(x,y) = 2x + 3y \qquad xy = 2$$

$$y = \frac{2}{x}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \; / \cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$h''(x) = 12x^{-3}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{-3} = \frac{4}{\sqrt{3}} > 0$$

lokalni minimum

$$h(\sqrt{3}) = 4\sqrt{3}$$

$$h''(-\sqrt{3}) =$$

2. način

$$f(x,y) = 2x + 3y \qquad xy = 2$$

$$y = \frac{2}{x}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

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$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$h''(x) = 12x^{-3}$$

$$h''\left(\sqrt{3}\right) = 12\sqrt{3}^{-3} = \frac{4}{\sqrt{3}} > 0$$

$$h\left(\sqrt{3}\right) = 4\sqrt{3}$$

lokalni minimum

$$h''\left(-\sqrt{3}\right) = 12 \cdot \left(-\sqrt{3}\right)^{-3}$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

$$y = \frac{2}{x}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \;/\cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$h''(x) = 12x^{-3}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{-3} = \frac{4}{\sqrt{3}} > 0$$

lokalni minimum

$$h(\sqrt{3}) = 4\sqrt{3}$$

$$h''(-\sqrt{3}) = 12 \cdot (-\sqrt{3})^{-3} = \frac{-4}{\sqrt{3}}$$

2. način

$$f(x, y) = 2x + 3y \qquad xy = 2$$

$$y = \frac{2}{x}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \ / \cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$h''(x) = 12x^{-3}$$

$$h''\left(\sqrt{3}\right) = 12\sqrt{3}^{-3} = \frac{4}{\sqrt{3}} > 0$$

$$h\left(\sqrt{3}\right) = 4\sqrt{3}$$

lokalni minimum

$$h''\left(-\sqrt{3}\right) = 12 \cdot \left(-\sqrt{3}\right)^{-3} = \frac{-4}{\sqrt{3}} < 0$$

2. način

$$f(x,y) = 2x + 3y \qquad xy = 2$$

$$y = \frac{2}{x}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

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$$2x^2 - 6 = 0$$

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$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$h''(x) = 12x^{-3}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{-3} = \frac{4}{\sqrt{3}} > 0$$

lokalni minimum

$$h(\sqrt{3}) = 4\sqrt{3}$$

$$h''(-\sqrt{3}) = 12 \cdot (-\sqrt{3})^{-3} = \frac{-4}{\sqrt{3}} < 0$$

lokalni maksimum

2. način

$$f(x,y) = 2x + 3y \qquad xy = 2$$

$$y = \frac{2}{x}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

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$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}$$

$$h''(x) = 12x^{-3}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{-3} = \frac{4}{\sqrt{3}} > 0$$

$$h(\sqrt{3}) = 4\sqrt{3}$$

lokalni minimum

$$h''(-\sqrt{3}) = 12 \cdot (-\sqrt{3})^{-3} = \frac{-4}{\sqrt{3}} < 0$$

$$h(-\sqrt{3}) =$$

lokalni maksimum

2. način

$$f(x,y) = 2x + 3y \qquad xy = 2$$

$$\boxed{y = \frac{2}{x}}$$

$$f\left(x, \frac{2}{x}\right) = 2x + 3 \cdot \frac{2}{x} = 2x + 6x^{-1}$$

$$h(x) = 2x + 6x^{-1}$$

$$h'(x) = 2 - 6x^{-2}$$

$$2 - 6x^{-2} = 0 \;/\cdot x^2$$

$$2x^2 - 6 = 0$$

$$x^2 = 3$$

$$\boxed{x_1 = \sqrt{3}, \quad x_2 = -\sqrt{3}}$$

$$h''(x) = 12x^{-3}$$

$$h''(\sqrt{3}) = 12\sqrt{3}^{\,-3} = \frac{4}{\sqrt{3}} > 0$$

$$h(\sqrt{3}) = 4\sqrt{3} \qquad \text{lokalni minimum}$$

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$$f(x,y) = 2x + 3y \qquad xy = 2$$

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$$f\left(\sqrt{3},\ \frac{2}{3}\sqrt{3}\right) = 4\sqrt{3}$$

uvjetni lokalni minimum

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$$f\left(\sqrt{3}, \frac{2}{3}\sqrt{3}\right) = 4\sqrt{3}$$ uvjetni lokalni minimum

$$f\left(-\sqrt{3}, -\frac{2}{3}\sqrt{3}\right) = -4\sqrt{3}$$ uvjetni lokalni maksimum

četvrti zadatak

Zadatak 4

Na elipsi $x^2 + 4y^2 = 4$ *pronađite najbliže i najdalje točke od pravca* $2x + 3y - 6 = 0$.

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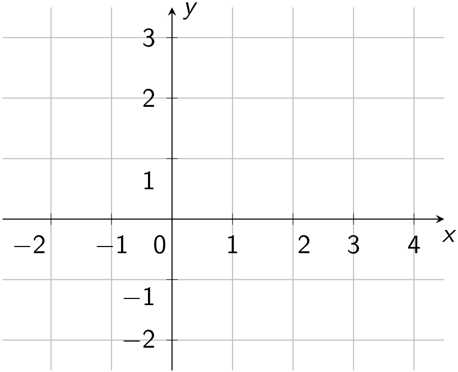

Rješenje

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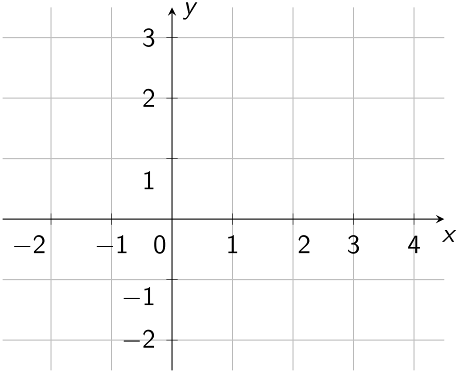

Rješenje

$$x^2 + 4y^2 = 4$$

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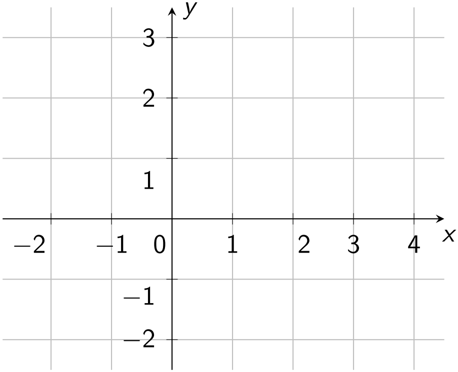

Rješenje

$$x^2 + 4y^2 = 4 \rightsquigarrow \frac{x^2}{4} + \frac{y^2}{1} = 1$$

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Rješenje

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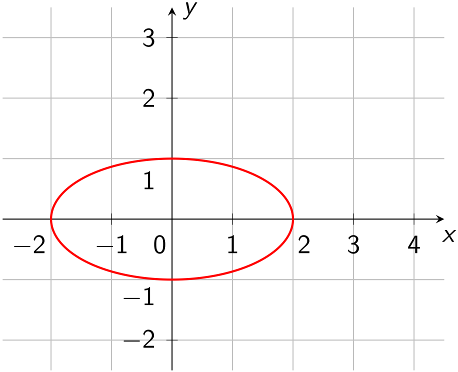

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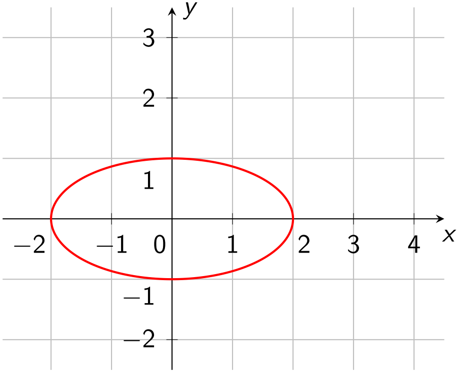

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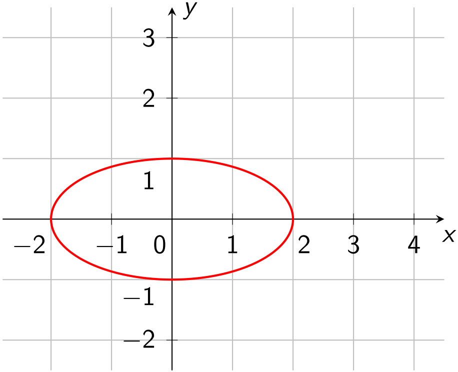
$$x^2 + 4y^2 = 4 \rightsquigarrow \frac{x^2}{4} + \frac{y^2}{1} = 1$$

$$2x + 3y - 6 = 0 \rightsquigarrow \frac{x}{3} + \frac{y}{2} = 1$$



Zadatak 4

Na elipsi $x^2 + 4y^2 = 4$ *pronađite najbliže i najdalje točke od pravca* $2x + 3y - 6 = 0$.

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

Rješenje

$$x^2 + 4y^2 = 4 \rightsquigarrow \frac{x^2}{4} + \frac{y^2}{1} = 1$$

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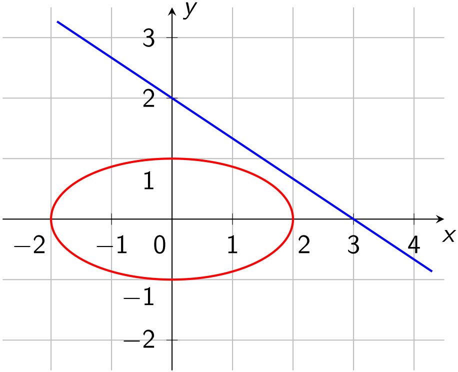

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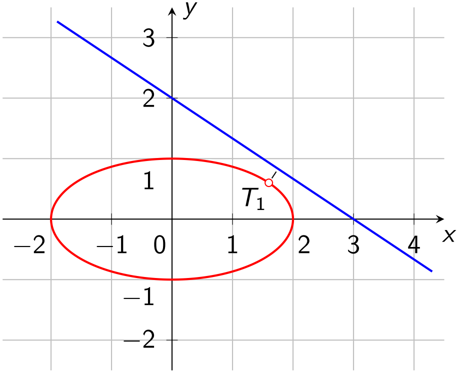

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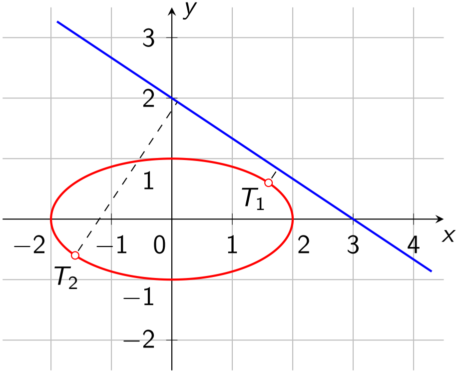

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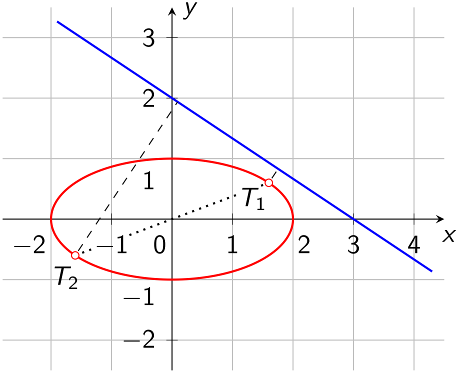

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Rješenje

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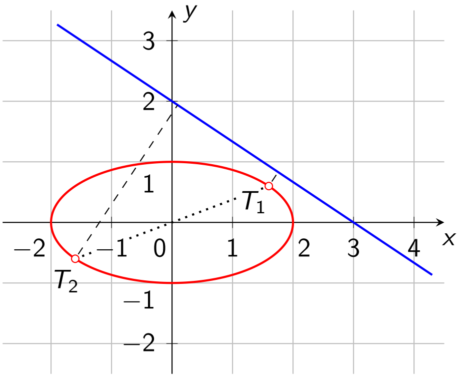

Udaljenost točke od pravca

Zadatak 4

Na elipsi $x^2 + 4y^2 = 4$ *pronađite najbliže i najdalje točke od pravca* $2x + 3y - 6 = 0$.

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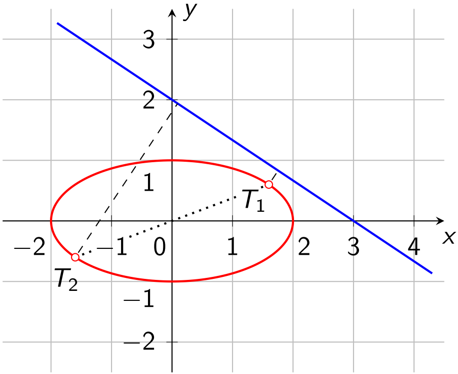

Udaljenost točke od pravca

$T_0(x_0, y_0) \quad p \ldots Ax + By + C = 0$

Zadatak 4

Na elipsi $x^2 + 4y^2 = 4$ *pronađite najbliže i najdalje točke od pravca* $2x + 3y - 6 = 0$.

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

Rješenje

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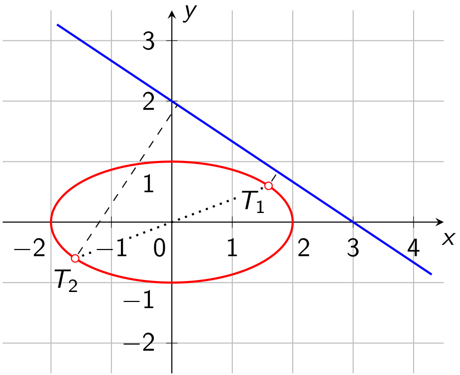


Udaljenost točke od pravca

$$T_0(x_0, y_0) \quad p \ldots Ax + By + C = 0$$

$$d = \frac{|Ax_0 + By_0 + C|}{\sqrt{A^2 + B^2}}$$

Zadatak 4

Na elipsi $x^2+4y^2=4$ pronađite najbliže i najdalje točke od pravca $2x+3y-6=0$.

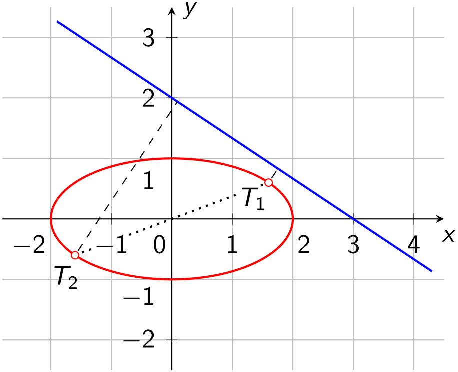
$$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$$

Rješenje

$$x^2+4y^2=4 \rightsquigarrow \frac{x^2}{4}+\frac{y^2}{1}=1$$

$$2x+3y-6=0 \rightsquigarrow \frac{x}{3}+\frac{y}{2}=1$$

$$d = \underline{\hspace{5cm}}$$



Udaljenost točke od pravca

$$T_0(x_0,y_0) \quad p\ldots\ Ax+By+C=0$$

$$d=\frac{|Ax_0+By_0+C|}{\sqrt{A^2+B^2}}$$

Zadatak 4

Na elipsi $x^2 + 4y^2 = 4$ pronađite najbliže i najdalje točke od pravca $2x + 3y - 6 = 0$.

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

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$$x^2 + 4y^2 = 4 \rightsquigarrow \frac{x^2}{4} + \frac{y^2}{1} = 1$$

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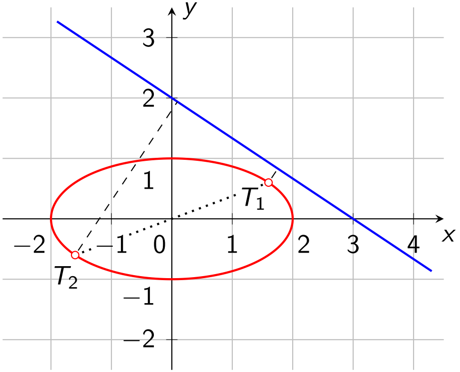
$$d = \frac{|2x + 3y - 6|}{}$$



Udaljenost točke od pravca

$$T_0(x_0, y_0) \quad p \ldots Ax + By + C = 0$$

$$d = \frac{|Ax_0 + By_0 + C|}{\sqrt{A^2 + B^2}}$$

Zadatak 4

Na elipsi $x^2 + 4y^2 = 4$ *pronađite najbliže i najdalje točke od pravca* $2x + 3y - 6 = 0$.

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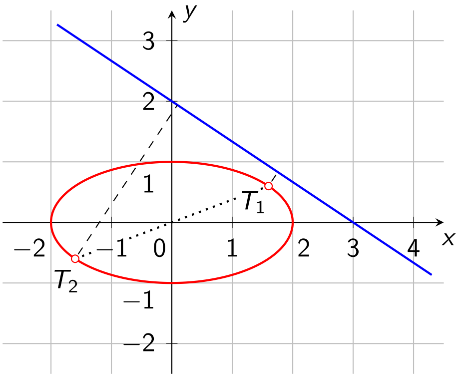
$$d = \frac{|2x + 3y - 6|}{\sqrt{2^2 + 3^2}}$$



Udaljenost točke od pravca

$$T_0(x_0, y_0) \quad p \ldots Ax + By + C = 0$$

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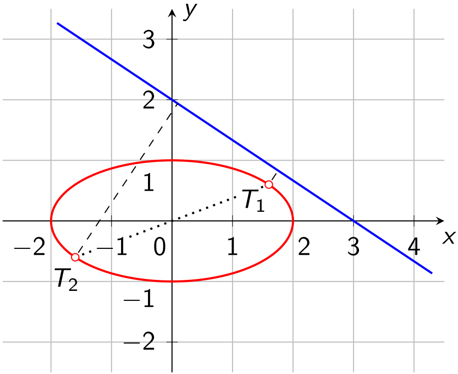
$$d = \frac{|2x + 3y - 6|}{\sqrt{2^2 + 3^2}}$$

$$d = \frac{|2x + 3y - 6|}{\sqrt{13}}$$



Udaljenost točke od pravca

$$T_0(x_0, y_0) \quad p \ldots Ax + By + C = 0$$

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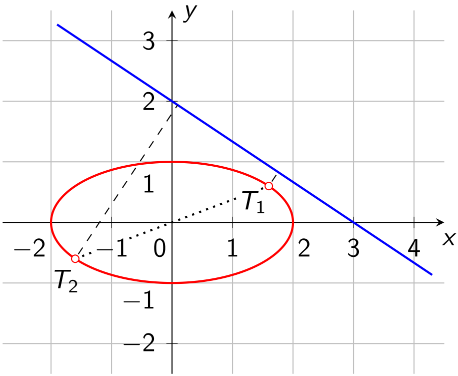

Udaljenost točke od pravca

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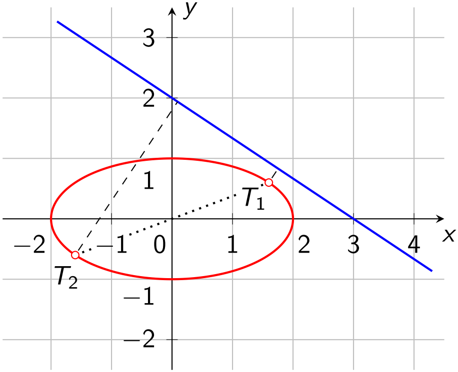
$$d = \frac{|2x + 3y - 6|}{\sqrt{2^2 + 3^2}}$$

$$\boxed{d = \frac{|2x + 3y - 6|}{\sqrt{13}}}$$

$$f(x, y) = 2x + 3y - 6$$



Udaljenost točke od pravca

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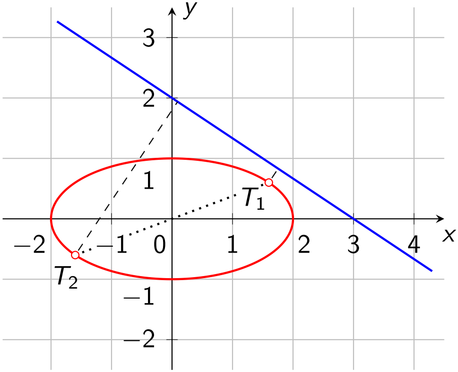
$$f(x, y) = 2x + 3y - 6$$

Tražimo ekstreme funkcije f uz uvjet $x^2 + 4y^2 = 4$.



Udaljenost točke od pravca

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uz uvjet $x^2 + 4y^2 = 4$.

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Tražimo ekstreme funkcije f uz uvjet $x^2 + 4y^2 = 4$.

$f(x,y) = 2x + 3y - 6$ $\qquad x^2 + 4y^2 = 4 \longrightarrow x^2 + 4y^2 - 4 = 0$

- Lagrangeova funkcija

Tražimo ekstreme funkcije f uz uvjet $x^2 + 4y^2 = 4$.

$f(x,y) = 2x + 3y - 6$ $\qquad$ $x^2 + 4y^2 = 4 \longrightarrow x^2 + 4y^2 - 4 = 0$

- Lagrangeova funkcija

$$L(x,y,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

Tražimo ekstreme funkcije f uz uvjet $x^2 + 4y^2 = 4$.

$f(x,y) = \boxed{2x + 3y - 6}$ $\qquad$ $x^2 + 4y^2 = 4 \longrightarrow x^2 + 4y^2 - 4 = 0$

funkcija

- Lagrangeova funkcija

$$L(x, y, \lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

Tražimo ekstreme funkcije f uz uvjet $x^2 + 4y^2 = 4$.

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funkcija

uvjet

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funkcija $\qquad$ uvjet

- Lagrangeova funkcija

$$L(x,y,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,\lambda) = 2x + 3y - 6 + \lambda\big(x^2 + 4y^2 - 4\big)$$

Tražimo ekstreme funkcije f uz uvjet $x^2 + 4y^2 = 4$.

$f(x,y) = \boxed{2x + 3y - 6}$ $\quad$ $x^2 + 4y^2 = 4 \longrightarrow \boxed{x^2 + 4y^2 - 4} = 0$

funkcija $\quad$ uvjet

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- Parcijalne derivacije Lagrangeove funkcije

$$L_x =$$

Tražimo ekstreme funkcije f uz uvjet $x^2 + 4y^2 = 4$.

$$f(x,y) = \boxed{2x + 3y - 6} \qquad x^2 + 4y^2 = 4 \longrightarrow \boxed{x^2 + 4y^2 - 4} = 0$$

funkcija

uvjet

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$$L(x,y,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

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- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2 + 2\lambda x$$

Tražimo ekstreme funkcije f uz uvjet $x^2 + 4y^2 = 4$.

$f(x,y) = \boxed{2x+3y-6}$ $\qquad x^2+4y^2=4 \longrightarrow \boxed{x^2+4y^2-4} = 0$

funkcija

uvjet

- Lagrangeova funkcija

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- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2 + 2\lambda x$$

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Tražimo ekstreme funkcije f uz uvjet $x^2+4y^2=4$.

$f(x,y) = \boxed{2x+3y-6}$ $\qquad x^2+4y^2=4 \longrightarrow \boxed{x^2+4y^2-4} = 0$

funkcija

uvjet

- Lagrangeova funkcija

$$L(x,y,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,\lambda) = 2x+3y-6+\lambda\big(x^2+4y^2-4\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2 + 2\lambda x$$

$$L_y = 3 + 8\lambda y$$

Tražimo ekstreme funkcije f uz uvjet $x^2+4y^2=4$.

$f(x,y) = \boxed{2x+3y-6}$ $\qquad x^2+4y^2=4 \longrightarrow \boxed{x^2+4y^2-4} = 0$

funkcija

uvjet

- Lagrangeova funkcija

$$L(x,y,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

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- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2+2\lambda x$$

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$$L_\lambda =$$

Tražimo ekstreme funkcije f uz uvjet $x^2+4y^2=4$.

$f(x, y) = \boxed{2x + 3y - 6}$ $\qquad$ $x^2 + 4y^2 = 4 \longrightarrow \boxed{x^2 + 4y^2 - 4} = 0$

funkcija $\qquad$ uvjet

- Lagrangeova funkcija

$$L(x, y, \lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x, y, \lambda) = 2x + 3y - 6 + \lambda\left(x^2 + 4y^2 - 4\right)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2 + 2\lambda x$$

$$L_y = 3 + 8\lambda y$$

$$L_\lambda = x^2 + 4y^2 - 4$$

Tražimo ekstreme funkcije f uz uvjet $x^2 + 4y^2 = 4$.

$f(x,y) = \boxed{2x+3y-6}$ $\quad$ $x^2+4y^2=4 \longrightarrow \boxed{x^2+4y^2-4} = 0$

funkcija $\quad$ uvjet

- Lagrangeova funkcija

$$L(x,y,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,\lambda) = 2x+3y-6+\lambda\big(x^2+4y^2-4\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$\begin{aligned} L_x &= 2+2\lambda x & \qquad 2+2\lambda x &= 0 \\ L_y &= 3+8\lambda y & \qquad 3+8\lambda y &= 0 \\ L_\lambda &= x^2+4y^2-4 & \qquad x^2+4y^2-4 &= 0 \end{aligned}$$

Tražimo ekstreme funkcije f uz uvjet $x^2+4y^2=4$.

$$\begin{aligned} 2 + 2\lambda x &= 0 \\ 3 + 8\lambda y &= 0 \\ x^2 + 4y^2 - 4 &= 0 \end{aligned}$$

$$
\begin{aligned}
2 + 2\lambda x &= 0 \longrightarrow \quad \lambda x = -1 \\
3 + 8\lambda y &= 0 \\
x^2 + 4y^2 - 4 &= 0
\end{aligned}
$$

$$2 + 2\lambda x = 0 \longrightarrow \lambda x = -1 \rightarrow \lambda = -\frac{1}{x}$$

$$3 + 8\lambda y = 0$$

$$x^2 + 4y^2 - 4 = 0$$

$$\begin{aligned} 2 + 2\lambda x &= 0 \longrightarrow \lambda x = -1 \nearrow \lambda = -\frac{1}{x} \\ 3 + 8\lambda y &= 0 \longrightarrow 8\lambda y = -3 \\ x^2 + 4y^2 - 4 &= 0 \end{aligned}$$

$$
\begin{aligned}
2 + 2\lambda x &= 0 \longrightarrow \quad \lambda x = -1 \quad \nearrow \lambda = -\frac{1}{x} \\
3 + 8\lambda y &= 0 \longrightarrow 8\lambda y = -3 \quad \searrow \lambda = -\frac{3}{8y} \\
x^2 + 4y^2 - 4 &= 0
\end{aligned}
$$

$$
\begin{array}{rcl}
2 + 2\lambda x = 0 & \longrightarrow & \lambda x = -1 \nearrow \lambda = -\dfrac{1}{x} \\
3 + 8\lambda y = 0 & \longrightarrow & 8\lambda y = -3 \searrow \lambda = -\dfrac{3}{8y} \\
x^2 + 4y^2 - 4 = 0 & &
\end{array}
\Bigg\} \Rightarrow \quad -\frac{1}{x} = -\frac{3}{8y}
$$

$$\left.\begin{array}{rl} 2+2\lambda x = 0 \longrightarrow & \lambda x = -1 \nearrow \lambda = -\dfrac{1}{x} \\ 3+8\lambda y = 0 \longrightarrow & 8\lambda y = -3 \searrow \lambda = -\dfrac{3}{8y} \\ x^2+4y^2-4 = 0 & \end{array}\right\} \Rightarrow \quad -\frac{1}{x} = -\frac{3}{8y}$$

$$8y = 3x$$

$$
\begin{aligned}
2 + 2\lambda x &= 0 \longrightarrow \lambda x = -1 \rightarrow \lambda = -\frac{1}{x} \\
3 + 8\lambda y &= 0 \longrightarrow 8\lambda y = -3 \rightarrow \lambda = -\frac{3}{8y} \\
x^2 + 4y^2 - 4 &= 0
\end{aligned}
$$

$$
\Rightarrow \quad -\frac{1}{x} = -\frac{3}{8y}
$$

$$
8y = 3x
$$

$$
y = \frac{3}{8}x
$$

$$2 + 2\lambda x = 0 \longrightarrow \lambda x = -1 \rightarrow \lambda = -\frac{1}{x}$$

$$3 + 8\lambda y = 0 \longrightarrow 8\lambda y = -3 \rightarrow \lambda = -\frac{3}{8y}$$

$$x^2 + 4y^2 - 4 = 0$$

$$\Rightarrow -\frac{1}{x} = -\frac{3}{8y}$$

$$8y = 3x$$

$$\boxed{y = \frac{3}{8}x}$$

$$2 + 2\lambda x = 0 \longrightarrow \lambda x = -1 \rightarrow \lambda = -\frac{1}{x}$$

$$3 + 8\lambda y = 0 \longrightarrow 8\lambda y = -3 \rightarrow \lambda = -\frac{3}{8y}$$

$$\Rightarrow \quad -\frac{1}{x} = -\frac{3}{8y}$$

$$8y = 3x$$

$$\boxed{y = \frac{3}{8}x}$$

$$x^2 + 4y^2 - 4 = 0 \longleftarrow y = \frac{3}{8}x$$

$$2 + 2\lambda x = 0 \longrightarrow \lambda x = -1 \rightarrow \lambda = -\frac{1}{x}$$

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$$x^2 + 4 \cdot \frac{9}{64}x^2 - 4 = 0$$

$$\begin{aligned} 2 + 2\lambda x &= 0 \longrightarrow \lambda x = -1 \rightarrow \lambda = -\frac{1}{x} \\ 3 + 8\lambda y &= 0 \longrightarrow 8\lambda y = -3 \rightarrow \lambda = -\frac{3}{8y} \\ x^2 + 4y^2 - 4 &= 0 \end{aligned}$$

$$\Rightarrow \quad -\frac{1}{x} = -\frac{3}{8y}$$

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$$x^2 + 4 \cdot \left(\frac{3}{8}x\right)^2 - 4 = 0$$

$$x^2 + 4 \cdot \frac{9}{64}x^2 - 4 = 0$$

$$x^2 + \frac{9}{16}x^2 = 4$$

$$2 + 2\lambda x = 0 \longrightarrow \lambda x = -1 \rightarrow \lambda = -\frac{1}{x}$$

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$$\left.\begin{matrix} \lambda = -\frac{1}{x} \\ \lambda = -\frac{3}{8y} \end{matrix}\right\} \Rightarrow -\frac{1}{x} = -\frac{3}{8y}$$

$$8y = 3x$$

$$\boxed{y = \frac{3}{8}x}$$

$$x^2 + 4y^2 - 4 = 0$$

$$x^2 + 4 \cdot \left(\frac{3}{8}x\right)^2 - 4 = 0$$

$$x^2 + 4 \cdot \frac{9}{64}x^2 - 4 = 0$$

$$x^2 + \frac{9}{16}x^2 = 4$$

$$\frac{25}{16}x^2 = 4$$

$$\begin{aligned} 2+2\lambda x &= 0 \longrightarrow \lambda x = -1 \rightarrow \lambda = -\frac{1}{x} \\ 3+8\lambda y &= 0 \longrightarrow 8\lambda y = -3 \rightarrow \lambda = -\frac{3}{8y} \\ x^2+4y^2-4 &= 0 \end{aligned}$$

$$\Rightarrow \quad -\frac{1}{x} = -\frac{3}{8y}$$

$$8y = 3x$$

$$\boxed{y = \frac{3}{8}x}$$

$$x^2 + 4\cdot\left(\frac{3}{8}x\right)^2 - 4 = 0$$

$$x^2 + 4\cdot\frac{9}{64}x^2 - 4 = 0$$

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$$2 + 2\lambda x = 0 \longrightarrow \lambda x = -1 \rightarrow \lambda = -\frac{1}{x}$$

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$$x^2 + \frac{9}{16}x^2 = 4$$

$$\frac{25}{16}x^2 = 4 \quad / \cdot \frac{16}{25}$$

$$x^2 = \frac{64}{25}$$

$$2 + 2\lambda x = 0 \longrightarrow \lambda x = -1 \rightarrow \lambda = -\frac{1}{x}$$

$$3 + 8\lambda y = 0 \longrightarrow 8\lambda y = -3 \rightarrow \lambda = -\frac{3}{8y}$$

$$x^2 + 4y^2 - 4 = 0$$

$$\Rightarrow \quad -\frac{1}{x} = -\frac{3}{8y}$$

$$8y = 3x$$

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$$x^2 + 4 \cdot \left(\frac{3}{8}x\right)^2 - 4 = 0$$

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$$\frac{25}{16}x^2 = 4 \quad \Big/ \cdot \frac{16}{25}$$

$$x^2 = \frac{64}{25}$$

$$x_1 = \frac{8}{5}, \quad x_2 = -\frac{8}{5}$$

$$2 + 2\lambda x = 0 \longrightarrow \lambda x = -1 \longrightarrow \lambda = -\frac{1}{x}$$

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$$x^2 = \frac{64}{25}$$

$$x_1 = \frac{8}{5}, \quad x_2 = -\frac{8}{5}$$

$$y_1 =$$

$$2 + 2\lambda x = 0 \longrightarrow \lambda x = -1 \to \lambda = -\frac{1}{x}$$

$$3 + 8\lambda y = 0 \longrightarrow 8\lambda y = -3 \to \lambda = -\frac{3}{8y}$$

$$\Rightarrow -\frac{1}{x} = -\frac{3}{8y}$$

$$8y = 3x$$

$$\boxed{y = \frac{3}{8}x}$$

$$x^2 + 4y^2 - 4 = 0$$

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$$\frac{25}{16}x^2 = 4 \quad / \cdot \frac{16}{25}$$

$$x^2 = \frac{64}{25}$$

$$x_1 = \frac{8}{5}, \quad x_2 = -\frac{8}{5}$$

$$y_1 = \frac{3}{8}x_1$$

$$2+2\lambda x=0 \longrightarrow \lambda x=-1 \rightarrow \lambda=-\frac{1}{x}$$

$$3+8\lambda y=0 \longrightarrow 8\lambda y=-3 \rightarrow \lambda=-\frac{3}{8y}$$

$$\Rightarrow \quad -\frac{1}{x}=-\frac{3}{8y}$$

$$8y=3x$$

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$$x^2+4\cdot\frac{9}{64}x^2-4=0$$

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$$\frac{25}{16}x^2=4 \quad \Big/ \cdot\frac{16}{25}$$

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$$
\begin{aligned}
2 + 2\lambda x &= 0 \longrightarrow \lambda x = -1 \rightarrow \lambda = -\frac{1}{x} \\
3 + 8\lambda y &= 0 \longrightarrow 8\lambda y = -3 \rightarrow \lambda = -\frac{3}{8y} \\
x^2 + 4y^2 - 4 &= 0
\end{aligned}
\quad \Rightarrow \quad -\frac{1}{x} = -\frac{3}{8y}
$$

$$8y = 3x$$

$$\boxed{y = \frac{3}{8}x}$$

$$x^2 + 4 \cdot \left(\frac{3}{8}x\right)^2 - 4 = 0$$

$$x^2 + 4 \cdot \frac{9}{64}x^2 - 4 = 0$$

$$x^2 + \frac{9}{16}x^2 = 4$$

$$\frac{25}{16}x^2 = 4 \;\Big/ \cdot \frac{16}{25}$$

$$x^2 = \frac{64}{25}$$

$$x_1 = \frac{8}{5}, \quad x_2 = -\frac{8}{5}$$

$$y_1 = \frac{3}{8}x_1 = \frac{3}{8} \cdot \frac{8}{5} = \frac{3}{5}$$

$$\left.\begin{array}{rcl} 2+2\lambda x=0 & \longrightarrow & \lambda x=-1 \quad \nearrow \quad \lambda=-\dfrac{1}{x} \\ 3+8\lambda y=0 & \longrightarrow & 8\lambda y=-3 \quad \searrow \quad \lambda=-\dfrac{3}{8y} \\ x^2+4y^2-4=0 & \longleftarrow & \end{array}\right\} \Rightarrow \quad -\frac{1}{x}=-\frac{3}{8y}$$

$$8y=3x$$

$$\boxed{y=\frac{3}{8}x}$$

$$x^2+4\cdot\left(\frac{3}{8}x\right)^2-4=0$$

$$x^2+4\cdot\frac{9}{64}x^2-4=0$$

$$x^2+\frac{9}{16}x^2=4$$

$$\frac{25}{16}x^2=4 \quad \Big/ \cdot \frac{16}{25}$$

$$x^2=\frac{64}{25}$$

$$x_1=\frac{8}{5}, \quad x_2=-\frac{8}{5}$$

$$y_1=\frac{3}{8}x_1=\frac{3}{8}\cdot\frac{8}{5}=\frac{3}{5}$$

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$$8y = 3x$$

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$$x^2 + 4y^2 - 4 = 0$$

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$$x^2 + 4 \cdot \frac{9}{64}x^2 - 4 = 0$$

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$$\frac{25}{16}x^2 = 4 \quad / \cdot \frac{16}{25}$$

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$$x_1 = \frac{8}{5}, \quad x_2 = -\frac{8}{5}$$

$$y_1 = \frac{3}{8}x_1 = \frac{3}{8} \cdot \frac{8}{5} = \frac{3}{5}$$

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$$y_2 = \frac{3}{8}x_2 = \frac{3}{8} \cdot \frac{-8}{5} = -\frac{3}{5}$$

Stacionarne točke

$$2 + 2\lambda x = 0 \longrightarrow \lambda x = -1 \rightarrow \lambda = -\frac{1}{x}$$

$$3 + 8\lambda y = 0 \longrightarrow 8\lambda y = -3 \rightarrow \lambda = -\frac{3}{8y}$$

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$$x_1 = \frac{8}{5}, \quad x_2 = -\frac{8}{5}$$

$$y_1 = \frac{3}{8}x_1 = \frac{3}{8} \cdot \frac{8}{5} = \frac{3}{5}$$

$$y_2 = \frac{3}{8}x_2 = \frac{3}{8} \cdot \frac{-8}{5} = -\frac{3}{5}$$

Stacionarne točke

$$T_1\left(\frac{8}{5}, \frac{3}{5}\right)$$

$$2 + 2\lambda x = 0 \longrightarrow \lambda x = -1 \rightarrow \lambda = -\frac{1}{x}$$

$$3 + 8\lambda y = 0 \longrightarrow 8\lambda y = -3 \rightarrow \lambda = -\frac{3}{8y}$$

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$$8y = 3x$$

$$y = \frac{3}{8}x$$

$$x^2 + 4y^2 - 4 = 0$$

$$x^2 + 4 \cdot \left(\frac{3}{8}x\right)^2 - 4 = 0$$

$$x^2 + 4 \cdot \frac{9}{64}x^2 - 4 = 0$$

$$x^2 + \frac{9}{16}x^2 = 4$$

$$\frac{25}{16}x^2 = 4 \; / \cdot \frac{16}{25}$$

$$x^2 = \frac{64}{25}$$

$$x_1 = \frac{8}{5}, \quad x_2 = -\frac{8}{5}$$

$$y_1 = \frac{3}{8}x_1 = \frac{3}{8} \cdot \frac{8}{5} = \frac{3}{5}$$

$$y_2 = \frac{3}{8}x_2 = \frac{3}{8} \cdot \frac{-8}{5} = -\frac{3}{5}$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{8}{5}}, \overset{y_1}{\frac{3}{5}}\right)$$

$$2 + 2\lambda x = 0 \longrightarrow \lambda x = -1 \rightarrow \lambda = -\frac{1}{x}$$

$$3 + 8\lambda y = 0 \longrightarrow 8\lambda y = -3 \rightarrow \lambda = -\frac{3}{8y}$$

$$x^2 + 4y^2 - 4 = 0$$

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$$x^2 + 4 \cdot \left(\frac{3}{8}x\right)^2 - 4 = 0$$

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$$\frac{25}{16}x^2 = 4 \quad / \cdot \frac{16}{25}$$

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$$x_1 = \frac{8}{5}, \quad x_2 = -\frac{8}{5}$$

$$y_1 = \frac{3}{8}x_1 = \frac{3}{8} \cdot \frac{8}{5} = \frac{3}{5}$$

$$y_2 = \frac{3}{8}x_2 = \frac{3}{8} \cdot \frac{-8}{5} = -\frac{3}{5}$$

Stacionarne točke

$$\overset{x_1 \;\; y_1}{T_1\left(\frac{8}{5}, \frac{3}{5}\right)} \qquad T_2\left(-\frac{8}{5}, -\frac{3}{5}\right)$$

$$\begin{aligned} 2+2\lambda x &= 0 \longrightarrow \lambda x = -1 \rightarrow \lambda = -\frac{1}{x} \\ 3+8\lambda y &= 0 \longrightarrow 8\lambda y = -3 \rightarrow \lambda = -\frac{3}{8y} \\ x^2+4y^2-4 &= 0 \end{aligned}$$

$$\Rightarrow \quad -\frac{1}{x} = -\frac{3}{8y}$$

$$8y = 3x$$

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$$x^2 + 4\cdot\left(\frac{3}{8}x\right)^2 - 4 = 0$$

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$$\frac{25}{16}x^2 = 4 \quad \Big/ \cdot \frac{16}{25}$$

$$x^2 = \frac{64}{25}$$

$$x_1 = \frac{8}{5}, \quad x_2 = -\frac{8}{5}$$

$$y_1 = \frac{3}{8}x_1 = \frac{3}{8}\cdot\frac{8}{5} = \frac{3}{5}$$

$$y_2 = \frac{3}{8}x_2 = \frac{3}{8}\cdot\frac{-8}{5} = -\frac{3}{5}$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{8}{5}}, \overset{y_1}{\frac{3}{5}}\right) \qquad T_2\left(\overset{x_2}{-\frac{8}{5}}, \overset{y_2}{-\frac{3}{5}}\right)$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{8}{5}},\ \overset{y_1}{\frac{3}{5}}\right) \qquad T_2\left(\overset{x_2}{-\frac{8}{5}},\ \overset{y_2}{-\frac{3}{5}}\right)$$

$f(x, y) = 2x + 3y - 6$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{8}{5}},\ \overset{y_1}{\frac{3}{5}}\right) \qquad T_2\left(\overset{x_2}{-\frac{8}{5}},\ \overset{y_2}{-\frac{3}{5}}\right)$$

$f(x, y) = 2x + 3y - 6$

$x^2 + 4y^2 = 4$

Stacionarne točke

$T_1\left(\underset{x_1}{\frac{8}{5}},\ \underset{y_1}{\frac{3}{5}}\right)$ $T_2\left(\underset{x_2}{-\frac{8}{5}},\ \underset{y_2}{-\frac{3}{5}}\right)$

$f(x, y) = 2x + 3y - 6$

$x^2 + 4y^2 = 4$

elipsa je kompaktni skup u ravnini

Stacionarne točke

$$T_1\left(\underset{x_1}{\frac{8}{5}},\ \underset{y_1}{\frac{3}{5}}\right) \qquad T_2\left(\underset{x_2}{-\frac{8}{5}},\ \underset{y_2}{-\frac{3}{5}}\right)$$

$f(x, y) = 2x + 3y - 6$ $\quad$ $x^2 + 4y^2 = 4$

neprekidna funkcija

elipsa je kompaktni skup u ravnini

Stacionarne točke

$T_1\left(\frac{8}{5}, \frac{3}{5}\right)$ $\quad$ (x_1, y_1)

$T_2\left(-\frac{8}{5}, -\frac{3}{5}\right)$ $\quad$ (x_2, y_2)

$f(x, y) = 2x + 3y - 6$ ← neprekidna funkcija

$x^2 + 4y^2 = 4$ → elipsa je kompaktni skup u ravnini

$f\left(\frac{8}{5}, \frac{3}{5}\right) =$

Stacionarne točke

$T_1\left(\frac{8}{5}, \frac{3}{5}\right)$ (x_1, y_1) $\quad T_2\left(-\frac{8}{5}, -\frac{3}{5}\right)$ (x_2, y_2)

$f(x, y) = 2x + 3y - 6$ ← neprekidna funkcija

$x^2 + 4y^2 = 4$ → elipsa je kompaktni skup u ravnini

$$f\left(\frac{8}{5},\ \frac{3}{5}\right) = 2 \cdot \frac{8}{5} + 3 \cdot \frac{3}{5} - 6$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{8}{5}},\ \overset{y_1}{\frac{3}{5}}\right) \qquad T_2\left(\overset{x_2}{-\frac{8}{5}},\ \overset{y_2}{-\frac{3}{5}}\right)$$

$f(x, y) = 2x + 3y - 6$

neprekidna funkcija

$x^2 + 4y^2 = 4$

elipsa je kompaktni skup u ravnini

$$f\left(\frac{8}{5},\ \frac{3}{5}\right) = 2 \cdot \frac{8}{5} + 3 \cdot \frac{3}{5} - 6 = -1$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{8}{5}},\ \overset{y_1}{\frac{3}{5}}\right) \qquad T_2\left(\overset{x_2}{-\frac{8}{5}},\ \overset{y_2}{-\frac{3}{5}}\right)$$

$$f(x,y) = 2x + 3y - 6$$

neprekidna funkcija

$$x^2 + 4y^2 = 4$$

elipsa je kompaktni skup u ravnini

$$f\left(\frac{8}{5},\ \frac{3}{5}\right) = 2 \cdot \frac{8}{5} + 3 \cdot \frac{3}{5} - 6 = -1$$

$$f\left(-\frac{8}{5},\ -\frac{3}{5}\right) =$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{8}{5}},\ \overset{y_1}{\frac{3}{5}}\right) \qquad T_2\left(\overset{x_2}{-\frac{8}{5}},\ \overset{y_2}{-\frac{3}{5}}\right)$$

$$f(x,y) = 2x + 3y - 6$$

$$x^2 + 4y^2 = 4$$

neprekidna funkcija

elipsa je kompaktni skup u ravnini

$$f\left(\frac{8}{5},\ \frac{3}{5}\right) = 2 \cdot \frac{8}{5} + 3 \cdot \frac{3}{5} - 6 = -1$$

$$f\left(-\frac{8}{5},\ -\frac{3}{5}\right) = 2 \cdot \frac{-8}{5} + 3 \cdot \frac{-3}{5} - 6$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{8}{5}},\ \overset{y_1}{\frac{3}{5}}\right) \qquad T_2\left(\overset{x_2}{-\frac{8}{5}},\ \overset{y_2}{-\frac{3}{5}}\right)$$

$$f(x,y) = 2x + 3y - 6$$

neprekidna funkcija

$$x^2 + 4y^2 = 4$$

elipsa je kompaktni skup u ravnini

$$f\left(\frac{8}{5}, \frac{3}{5}\right) = 2 \cdot \frac{8}{5} + 3 \cdot \frac{3}{5} - 6 = -1$$

$$f\left(-\frac{8}{5}, -\frac{3}{5}\right) = 2 \cdot \frac{-8}{5} + 3 \cdot \frac{-3}{5} - 6 = -11$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{8}{5}}, \overset{y_1}{\frac{3}{5}}\right) \qquad T_2\left(\overset{x_2}{-\frac{8}{5}}, \overset{y_2}{-\frac{3}{5}}\right)$$

$$f(x,y) = 2x + 3y - 6$$

neprekidna funkcija

$$x^2 + 4y^2 = 4$$

elipsa je kompaktni skup u ravnini

$$d = \frac{|2x + 3y - 6|}{\sqrt{13}}$$

$$f\left(\frac{8}{5},\ \frac{3}{5}\right) = 2 \cdot \frac{8}{5} + 3 \cdot \frac{3}{5} - 6 = -1$$

$$f\left(-\frac{8}{5},\ -\frac{3}{5}\right) = 2 \cdot \frac{-8}{5} + 3 \cdot \frac{-3}{5} - 6 = -11$$

Stacionarne točke

$$T_1\left(\underset{x_1}{\frac{8}{5}},\ \underset{y_1}{\frac{3}{5}}\right) \qquad T_2\left(\underset{x_2}{-\frac{8}{5}},\ \underset{y_2}{-\frac{3}{5}}\right)$$

$$f(x,y) = 2x + 3y - 6 \qquad x^2 + 4y^2 = 4$$

$$d = \frac{|2x + 3y - 6|}{\sqrt{13}}$$

neprekidna funkcija

elipsa je kompaktni skup u ravnini

$$f\left(\frac{8}{5},\ \frac{3}{5}\right) = 2 \cdot \frac{8}{5} + 3 \cdot \frac{3}{5} - 6 = -1 \rightsquigarrow d_1 = \frac{1}{\sqrt{13}}$$

$$f\left(-\frac{8}{5},\ -\frac{3}{5}\right) = 2 \cdot \frac{-8}{5} + 3 \cdot \frac{-3}{5} - 6 = -11$$

Stacionarne točke

$$T_1\left(\underset{x_1}{\frac{8}{5}},\ \underset{y_1}{\frac{3}{5}}\right) \qquad T_2\left(\underset{x_2}{-\frac{8}{5}},\ \underset{y_2}{-\frac{3}{5}}\right)$$

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$$f\left(-\frac{8}{5}, -\frac{3}{5}\right) = 2 \cdot \frac{-8}{5} + 3 \cdot \frac{-3}{5} - 6 = -11 \rightsquigarrow d_2 = \frac{11}{\sqrt{13}}$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{8}{5}}, \overset{y_1}{\frac{3}{5}}\right) \qquad T_2\left(\overset{x_2}{-\frac{8}{5}}, \overset{y_2}{-\frac{3}{5}}\right)$$

$$f(x,y) = 2x + 3y - 6$$

neprekidna funkcija

$$x^2 + 4y^2 = 4$$

elipsa je kompaktni skup u ravnini

$$d = \frac{|2x + 3y - 6|}{\sqrt{13}}$$

$$f\left(\frac{8}{5}, \frac{3}{5}\right) = 2 \cdot \frac{8}{5} + 3 \cdot \frac{3}{5} - 6 = -1 \rightsquigarrow d_1 = \frac{1}{\sqrt{13}}$$

$$f\left(-\frac{8}{5}, -\frac{3}{5}\right) = 2 \cdot \frac{-8}{5} + 3 \cdot \frac{-3}{5} - 6 = -11 \rightsquigarrow d_2 = \frac{11}{\sqrt{13}}$$

Stacionarne točke

najbliža točka

$$T_1\left(\overset{x_1}{\frac{8}{5}}, \overset{y_1}{\frac{3}{5}}\right) \qquad T_2\left(\overset{x_2}{-\frac{8}{5}}, \overset{y_2}{-\frac{3}{5}}\right)$$

$$f(x,y) = 2x + 3y - 6$$

neprekidna funkcija

$$x^2 + 4y^2 = 4$$

elipsa je kompaktni skup u ravnini

$$d = \frac{|2x+3y-6|}{\sqrt{13}}$$

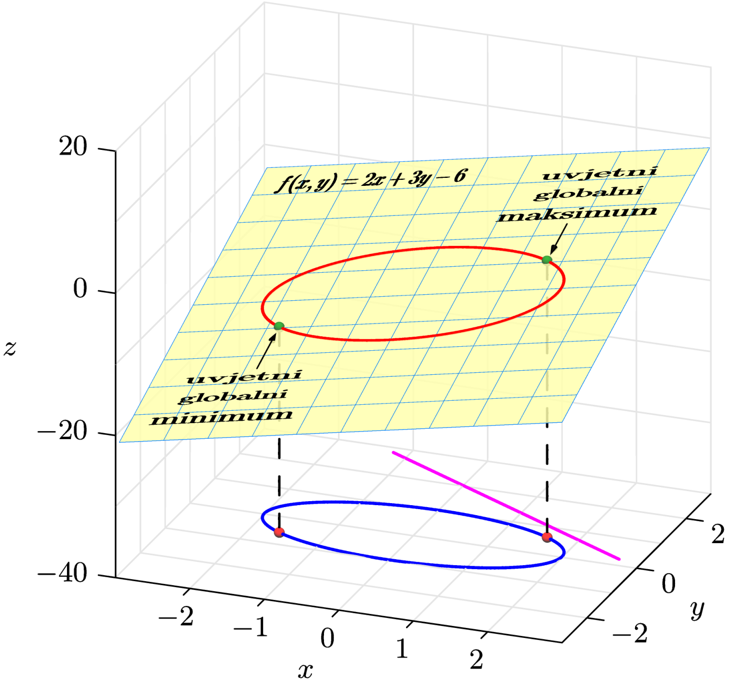
$$f\left(\frac{8}{5},\ \frac{3}{5}\right) = 2 \cdot \frac{8}{5} + 3 \cdot \frac{3}{5} - 6 = -1 \rightsquigarrow d_1 = \frac{1}{\sqrt{13}}$$

$$f\left(-\frac{8}{5},\ -\frac{3}{5}\right) = 2 \cdot \frac{-8}{5} + 3 \cdot \frac{-3}{5} - 6 = -11 \rightsquigarrow d_2 = \frac{11}{\sqrt{13}}$$

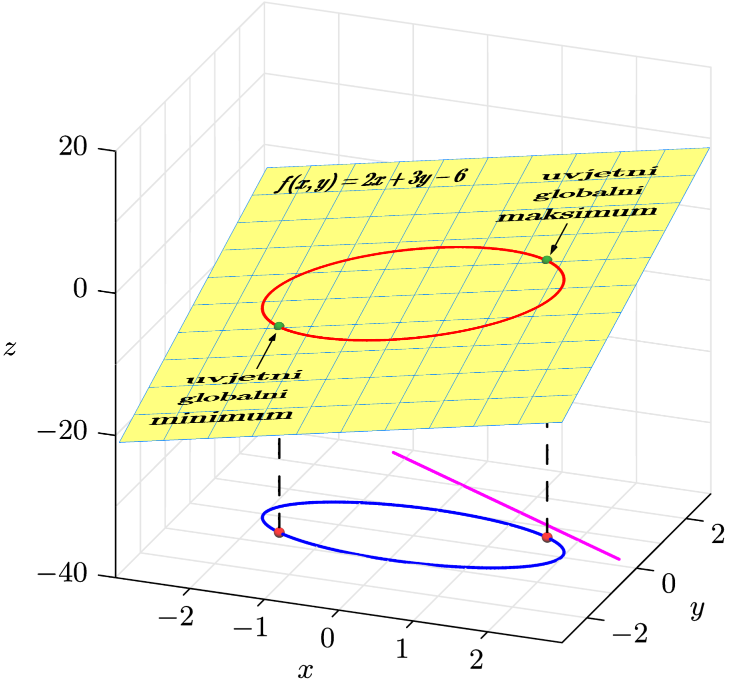
Stacionarne točke

najbliža točka → $T_1\left(\overset{x_1}{\frac{8}{5}},\ \overset{y_1}{\frac{3}{5}}\right)$

najudaljenija točka → $T_2\left(\overset{x_2}{-\frac{8}{5}},\ \overset{y_2}{-\frac{3}{5}}\right)$



$f(x,y) = 2x + 3y - 6$
uvjetni
globalni
maksimum
uvjetni
globalni
minimum
20
0
−20
−40
z
−2
−1
0
1
2
x
2
0
−2
y



20
0
−20
−40
z
$f(x,y) = 2x + 3y - 6$
uvjetni
globalni
maksimum
uvjetni
globalni
minimum
−2
−1
0
1
2
x
2
0
−2
y

peti zadatak

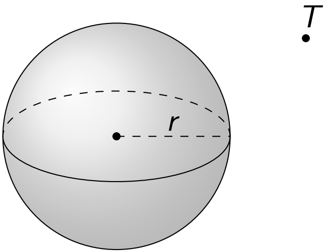
Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ *točke koje su najbliže i najdalje od točke* $T(3, 1, -1)$.

Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ *točke koje su najbliže i najdalje od točke* $T(3, 1, -1)$.

Rješenje

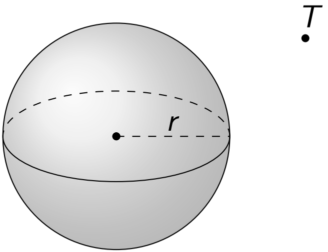


Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ *točke koje su najbliže i najdalje od točke* $T(3, 1, -1)$.

Rješenje

$T(3, 1, -1)$

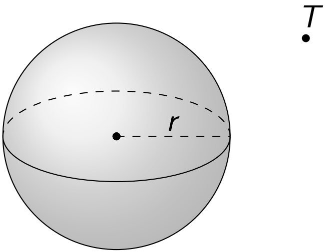


Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ *točke koje su najbliže i najdalje od točke* $T(3, 1, -1)$.

Rješenje

$T(3, 1, -1), \; r = 2$

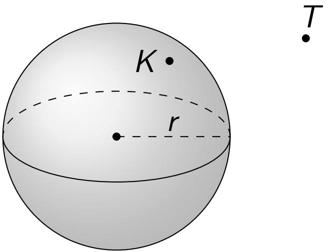


Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ *točke koje su najbliže i najdalje od točke* $T(3, 1, -1)$.

Rješenje

$T(3, 1, -1),\ r = 2,\ K(x, y, z)$

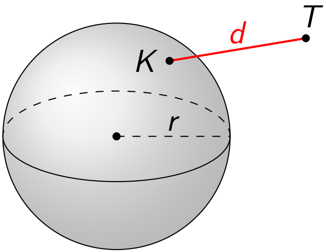


Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ *točke koje su najbliže i najdalje od točke* $T(3, 1, -1)$.

Rješenje

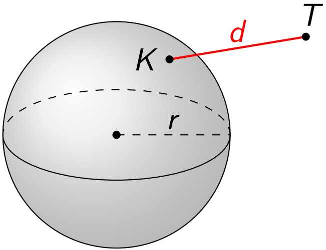
$T(3, 1, -1), \; r = 2, \; K(x, y, z)$



Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ *točke koje su najbliže i najdalje od točke* $T(3, 1, -1)$.

Rješenje

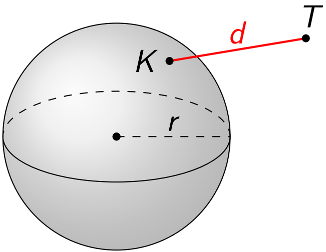


$T(3, 1, -1),\ r = 2,\ K(x, y, z)$

$d =$

Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ *točke koje su najbliže i najdalje od točke* $T(3, 1, -1)$.



Rješenje

$T(3, 1, -1),\ r = 2,\ K(x, y, z)$

$d = \sqrt{}$

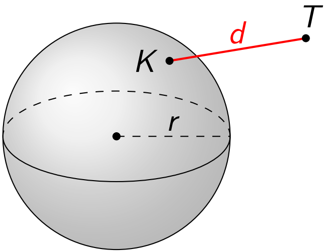
Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ *točke koje su najbliže i najdalje od točke* $T(3, 1, -1)$.

Rješenje

$T(3, 1, -1), \ r = 2, \ K(x, y, z)$

$d = \sqrt{(x-3)^2 }$



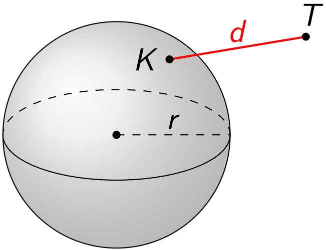
Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ *točke koje su najbliže i najdalje od točke* $T(3, 1, -1)$.

Rješenje

$T(3, 1, -1),\ r = 2,\ K(x, y, z)$

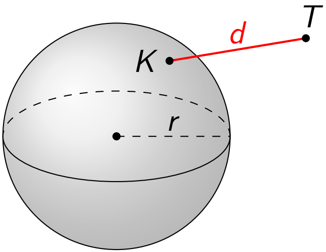
$d = \sqrt{(x-3)^2 + (y-1)^2 \qquad\qquad\qquad}$



Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ *točke koje su najbliže i najdalje od točke* $T(3, 1, -1)$.

Rješenje



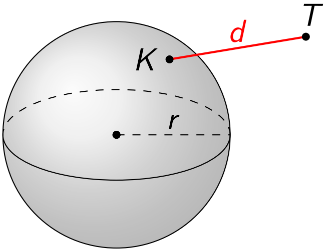
$T(3, 1, -1), \; r = 2, \; K(x, y, z)$

$d = \sqrt{(x-3)^2 + (y-1)^2 + (z+1)^2}$

Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ *točke koje su najbliže i najdalje od točke* $T(3, 1, -1)$.

Rješenje



$T(3, 1, -1), \ r = 2, \ K(x, y, z)$

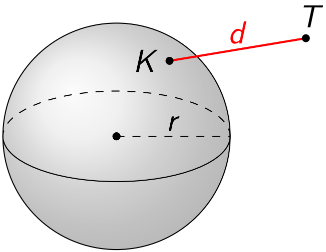
$d = \sqrt{(x-3)^2 + (y-1)^2 + (z+1)^2}$

$d^2 =$

Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ *točke koje su najbliže i najdalje od točke* $T(3, 1, -1)$.

Rješenje



$T(3, 1, -1), \; r = 2, \; K(x, y, z)$

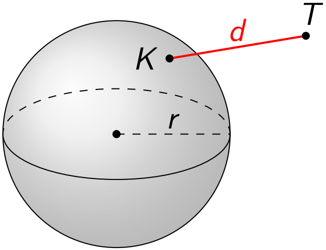
$d = \sqrt{(x-3)^2 + (y-1)^2 + (z+1)^2}$

$d^2 = (x-3)^2 + (y-1)^2 + (z+1)^2$

Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ *točke koje su najbliže i najdalje od točke* $T(3, 1, -1)$.

Rješenje



$T(3, 1, -1),\ r = 2,\ K(x, y, z)$

$d = \sqrt{(x-3)^2 + (y-1)^2 + (z+1)^2}$

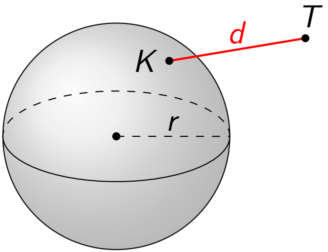
$d^2 = (x-3)^2 + (y-1)^2 + (z+1)^2$

$f(x, y, z) =$

Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ *točke koje su najbliže i najdalje od točke* $T(3, 1, -1)$.

Rješenje



$T(3, 1, -1), \; r = 2, \; K(x, y, z)$

$$d = \sqrt{(x-3)^2 + (y-1)^2 + (z+1)^2}$$

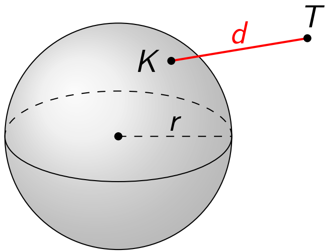
$$d^2 = (x-3)^2 + (y-1)^2 + (z+1)^2$$

$$f(x, y, z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$

Zadatak 5

Pronađite na sferi $x^2+y^2+z^2=4$ *točke koje su najbliže i najdalje od točke* $T(3,1,-1)$.

Rješenje



$T(3,1,-1),\ r=2,\ K(x,y,z)$

$d=\sqrt{(x-3)^2+(y-1)^2+(z+1)^2}$

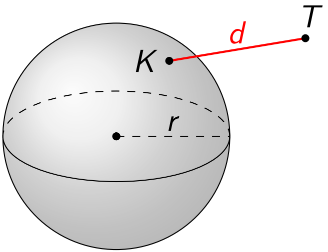
$d^2=(x-3)^2+(y-1)^2+(z+1)^2$

$f(x,y,z)=(x-3)^2+(y-1)^2+(z+1)^2$

točka K mora biti na sferi

Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ točke koje su najbliže i najdalje od točke $T(3, 1, -1)$.



Rješenje

$T(3, 1, -1),\ r = 2,\ K(x, y, z)$

$d = \sqrt{(x-3)^2 + (y-1)^2 + (z+1)^2}$

$d^2 = (x-3)^2 + (y-1)^2 + (z+1)^2$

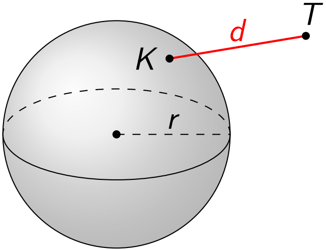
$f(x, y, z) = (x-3)^2 + (y-1)^2 + (z+1)^2$

$x^2 + y^2 + z^2 = 4 \longleftarrow$ točka K mora biti na sferi

Zadatak 5

Pronađite na sferi $x^2 + y^2 + z^2 = 4$ točke koje su najbliže i najdalje od točke $T(3, 1, -1)$.

Rješenje



$T(3, 1, -1), \; r = 2, \; K(x, y, z)$

$d = \sqrt{(x-3)^2 + (y-1)^2 + (z+1)^2}$

$d^2 = (x-3)^2 + (y-1)^2 + (z+1)^2$

$f(x, y, z) = (x-3)^2 + (y-1)^2 + (z+1)^2$

$x^2 + y^2 + z^2 = 4 \longleftarrow$ točka K mora biti na sferi

Tražimo ekstreme funkcije f uz uvjet $x^2 + y^2 + z^2 = 4$.

$$f(x, y, z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$

$$f(x, y, z) = (x - 3)^2 + (y - 1)^2 + (z + 1)^2$$

$$x^2 + y^2 + z^2 = 4$$

$$f(x, y, z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$

$$x^2 + y^2 + z^2 = 4 \longrightarrow x^2 + y^2 + z^2 - 4 = 0$$

$$f(x, y, z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$

$$x^2 + y^2 + z^2 = 4 \longrightarrow x^2 + y^2 + z^2 - 4 = 0$$

- Lagrangeova funkcija

$$f(x, y, z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$

$$x^2 + y^2 + z^2 = 4 \longrightarrow x^2 + y^2 + z^2 - 4 = 0$$

- Lagrangeova funkcija

  $L(x, y, z, \lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$

$f(x, y, z) = \boxed{(x-3)^2 + (y-1)^2 + (z+1)^2} \longleftarrow$ funkcija

$x^2 + y^2 + z^2 = 4 \longrightarrow x^2 + y^2 + z^2 - 4 = 0$

- Lagrangeova funkcija

  $L(x, y, z, \lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$

$$f(x,y,z) = \boxed{(x-3)^2 + (y-1)^2 + (z+1)^2} \longleftarrow \text{funkcija}$$

$$x^2 + y^2 + z^2 = 4 \longrightarrow \boxed{x^2 + y^2 + z^2 - 4} = 0$$

uvjet

- Lagrangeova funkcija

$$L(x,y,z,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$f(x,y,z) = \boxed{(x-3)^2 + (y-1)^2 + (z+1)^2} \longleftarrow \text{funkcija}$$

$$x^2 + y^2 + z^2 = 4 \longrightarrow \boxed{x^2 + y^2 + z^2 - 4} = 0$$

uvjet

- Lagrangeova funkcija

$$L(x,y,z,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,z,\lambda) = (x-3)^2 + (y-1)^2 + (z+1)^2 + \lambda\left(x^2 + y^2 + z^2 - 4\right)$$

$$f(x,y,z) = \boxed{(x-3)^2 + (y-1)^2 + (z+1)^2} \longleftarrow \text{funkcija}$$

$$x^2 + y^2 + z^2 = 4 \longrightarrow \boxed{x^2 + y^2 + z^2 - 4} = 0$$

uvjet

- Lagrangeova funkcija

$$L(x,y,z,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,z,\lambda) = (x-3)^2 + (y-1)^2 + (z+1)^2 + \lambda\big(x^2 + y^2 + z^2 - 4\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x =$$

$$f(x,y,z) = \boxed{(x-3)^2 + (y-1)^2 + (z+1)^2} \leftarrow \text{funkcija}$$

$$x^2 + y^2 + z^2 = 4 \longrightarrow \boxed{x^2 + y^2 + z^2 - 4} = 0$$

uvjet

- Lagrangeova funkcija

$$L(x,y,z,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,z,\lambda) = (x-3)^2 + (y-1)^2 + (z+1)^2 + \lambda\big(x^2 + y^2 + z^2 - 4\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2(x-3) + 2\lambda x$$

$f(x,y,z) = \boxed{(x-3)^2 + (y-1)^2 + (z+1)^2} \longleftarrow$ funkcija

$x^2 + y^2 + z^2 = 4 \longrightarrow \boxed{x^2 + y^2 + z^2 - 4} = 0$

uvjet

- Lagrangeova funkcija

$$L(x,y,z,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,z,\lambda) = (x-3)^2 + (y-1)^2 + (z+1)^2 + \lambda\big(x^2 + y^2 + z^2 - 4\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2(x-3) + 2\lambda x$$

$$L_y =$$

$$f(x,y,z) = \boxed{(x-3)^2 + (y-1)^2 + (z+1)^2} \longleftarrow \text{funkcija}$$

$$x^2 + y^2 + z^2 = 4 \longrightarrow \boxed{x^2 + y^2 + z^2 - 4} = 0$$

uvjet

- Lagrangeova funkcija

$$L(x,y,z,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,z,\lambda) = (x-3)^2 + (y-1)^2 + (z+1)^2 + \lambda\big(x^2 + y^2 + z^2 - 4\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2(x-3) + 2\lambda x$$

$$L_y = 2(y-1) + 2\lambda y$$

$$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$ ← funkcija

$$x^2 + y^2 + z^2 = 4 \longrightarrow x^2 + y^2 + z^2 - 4 = 0$$

(uvjet: $x^2 + y^2 + z^2 - 4$)

- Lagrangeova funkcija

$$L(x,y,z,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,z,\lambda) = (x-3)^2 + (y-1)^2 + (z+1)^2 + \lambda\big(x^2 + y^2 + z^2 - 4\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2(x-3) + 2\lambda x$$

$$L_y = 2(y-1) + 2\lambda y$$

$$L_z =$$

$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2$ ← funkcija

$x^2 + y^2 + z^2 = 4 \longrightarrow x^2 + y^2 + z^2 - 4 = 0$ ← uvjet

- Lagrangeova funkcija

$$L(x,y,z,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,z,\lambda) = (x-3)^2 + (y-1)^2 + (z+1)^2 + \lambda\big(x^2 + y^2 + z^2 - 4\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2(x-3) + 2\lambda x$$

$$L_y = 2(y-1) + 2\lambda y$$

$$L_z = 2(z+1) + 2\lambda z$$

$$f(x,y,z) = \boxed{(x-3)^2 + (y-1)^2 + (z+1)^2} \leftarrow \text{funkcija}$$

$$x^2 + y^2 + z^2 = 4 \longrightarrow \boxed{x^2 + y^2 + z^2 - 4} = 0$$

uvjet

- Lagrangeova funkcija

$$L(x,y,z,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,z,\lambda) = (x-3)^2 + (y-1)^2 + (z+1)^2 + \lambda\big(x^2 + y^2 + z^2 - 4\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2(x-3) + 2\lambda x$$

$$L_y = 2(y-1) + 2\lambda y$$

$$L_z = 2(z+1) + 2\lambda z$$

$$L_\lambda =$$

$f(x,y,z) = \boxed{(x-3)^2 + (y-1)^2 + (z+1)^2} \longleftarrow$ funkcija

$x^2 + y^2 + z^2 = 4 \longrightarrow \boxed{x^2 + y^2 + z^2 - 4} = 0$

uvjet

- Lagrangeova funkcija

$$L(x,y,z,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,z,\lambda) = (x-3)^2 + (y-1)^2 + (z+1)^2 + \lambda\big(x^2 + y^2 + z^2 - 4\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2(x-3) + 2\lambda x$$

$$L_y = 2(y-1) + 2\lambda y$$

$$L_z = 2(z+1) + 2\lambda z$$

$$L_\lambda = x^2 + y^2 + z^2 - 4$$

$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2$ ← funkcija

$x^2 + y^2 + z^2 = 4 \longrightarrow x^2 + y^2 + z^2 - 4 = 0$ ← uvjet

- Lagrangeova funkcija

$$L(x,y,z,\lambda) = \text{funkcija} + \lambda \cdot \text{uvjet}$$

$$L(x,y,z,\lambda) = (x-3)^2 + (y-1)^2 + (z+1)^2 + \lambda\big(x^2 + y^2 + z^2 - 4\big)$$

- Parcijalne derivacije Lagrangeove funkcije

$$L_x = 2(x-3) + 2\lambda x \qquad 2(x-3) + 2\lambda x = 0$$

$$L_y = 2(y-1) + 2\lambda y \qquad 2(y-1) + 2\lambda y = 0$$

$$L_z = 2(z+1) + 2\lambda z \qquad 2(z+1) + 2\lambda z = 0$$

$$L_\lambda = x^2 + y^2 + z^2 - 4 \qquad x^2 + y^2 + z^2 - 4 = 0$$

$$
\begin{aligned}
2(x-3) + 2\lambda x &= 0 \\
2(y-1) + 2\lambda y &= 0 \\
2(z+1) + 2\lambda z &= 0 \\
x^2 + y^2 + z^2 - 4 &= 0
\end{aligned}
$$

$$2(x-3)+2\lambda x=0$$

$$\begin{aligned} 2(x-3)+2\lambda x&=0\\ 2(y-1)+2\lambda y&=0\\ 2(z+1)+2\lambda z&=0\\ x^2+y^2+z^2-4&=0 \end{aligned}$$

$$2(x-3)+2\lambda x=0 \;/:2$$

$$\begin{aligned} 2(x-3)+2\lambda x&=0\\ 2(y-1)+2\lambda y&=0\\ 2(z+1)+2\lambda z&=0\\ x^2+y^2+z^2-4&=0 \end{aligned}$$

$$2(x-3)+2\lambda x = 0 \,/\!: 2$$
$$x - 3 + \lambda x = 0$$

$$\begin{aligned} 2(x-3)+2\lambda x &= 0 \\ 2(y-1)+2\lambda y &= 0 \\ 2(z+1)+2\lambda z &= 0 \\ x^2+y^2+z^2-4 &= 0 \end{aligned}$$

$$2(x-3)+2\lambda x=0 \;/:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$

$$\begin{aligned} 2(x-3)+2\lambda x&=0\\ 2(y-1)+2\lambda y&=0\\ 2(z+1)+2\lambda z&=0\\ x^2+y^2+z^2-4&=0 \end{aligned}$$

$$2(x-3)+2\lambda x=0 \;/:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$x=\frac{3}{\lambda+1}$$

$$\begin{aligned} 2(x-3)+2\lambda x&=0\\ 2(y-1)+2\lambda y&=0\\ 2(z+1)+2\lambda z&=0\\ x^2+y^2+z^2-4&=0 \end{aligned}$$

$$2(x-3)+2\lambda x = 0 \;/:2$$

$$x-3+\lambda x = 0$$

$$(\lambda+1)x = 3$$

$$\boxed{x = \frac{3}{\lambda+1}}$$

$$2(x-3)+2\lambda x = 0$$
$$2(y-1)+2\lambda y = 0$$
$$2(z+1)+2\lambda z = 0$$
$$x^2+y^2+z^2-4 = 0$$

$$2(x-3)+2\lambda x = 0 \;/:2$$

$$x-3+\lambda x = 0$$

$$(\lambda+1)x = 3$$

$$\boxed{x = \frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y = 0$$

$$2(x-3)+2\lambda x = 0$$
$$2(y-1)+2\lambda y = 0$$
$$2(z+1)+2\lambda z = 0$$
$$x^2+y^2+z^2-4 = 0$$

$$2(x-3)+2\lambda x = 0 \;/:2$$

$$x-3+\lambda x = 0$$

$$(\lambda+1)x = 3$$

$$\boxed{x = \frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y = 0 \;/:2$$

$$\begin{aligned} 2(x-3)+2\lambda x &= 0 \\ 2(y-1)+2\lambda y &= 0 \\ 2(z+1)+2\lambda z &= 0 \\ x^2+y^2+z^2-4 &= 0 \end{aligned}$$

$$2(x-3)+2\lambda x = 0 \; / : 2$$
$$x - 3 + \lambda x = 0$$
$$(\lambda + 1)x = 3$$
$$\boxed{x = \frac{3}{\lambda + 1}}$$

$$2(y-1)+2\lambda y = 0 \; / : 2$$
$$y - 1 + \lambda y = 0$$

$$\begin{aligned} 2(x-3)+2\lambda x &= 0 \\ 2(y-1)+2\lambda y &= 0 \\ 2(z+1)+2\lambda z &= 0 \\ x^2+y^2+z^2-4 &= 0 \end{aligned}$$

$$2(x-3)+2\lambda x=0 \; / :2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0 \; / :2$$
$$y-1+\lambda y=0$$
$$(\lambda+1)y=1$$

$$\begin{aligned} 2(x-3)+2\lambda x&=0 \\ 2(y-1)+2\lambda y&=0 \\ 2(z+1)+2\lambda z&=0 \\ x^2+y^2+z^2-4&=0 \end{aligned}$$

$$2(x-3)+2\lambda x=0 \;/:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0 \;/:2$$
$$y-1+\lambda y=0$$
$$(\lambda+1)y=1$$
$$y=\frac{1}{\lambda+1}$$

$$2(x-3)+2\lambda x=0$$
$$2(y-1)+2\lambda y=0$$
$$2(z+1)+2\lambda z=0$$
$$x^2+y^2+z^2-4=0$$

$$2(x-3)+2\lambda x=0 \;/:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0 \;/:2$$
$$y-1+\lambda y=0$$
$$(\lambda+1)y=1$$
$$\boxed{y=\frac{1}{\lambda+1}}$$

$$2(x-3)+2\lambda x=0$$
$$2(y-1)+2\lambda y=0$$
$$2(z+1)+2\lambda z=0$$
$$x^2+y^2+z^2-4=0$$

$$2(x-3)+2\lambda x=0 \,/:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0 \,/:2$$
$$y-1+\lambda y=0$$
$$(\lambda+1)y=1$$
$$\boxed{y=\frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z=0$$

$$2(x-3)+2\lambda x=0$$
$$2(y-1)+2\lambda y=0$$
$$2(z+1)+2\lambda z=0$$
$$x^2+y^2+z^2-4=0$$

$$2(x-3)+2\lambda x=0 \;/:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0 \;/:2$$
$$y-1+\lambda y=0$$
$$(\lambda+1)y=1$$
$$\boxed{y=\frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z=0 \;/:2$$

$$\begin{aligned}2(x-3)+2\lambda x&=0\\2(y-1)+2\lambda y&=0\\2(z+1)+2\lambda z&=0\\x^2+y^2+z^2-4&=0\end{aligned}$$

$$2(x-3)+2\lambda x = 0 \,/:2$$
$$x-3+\lambda x = 0$$
$$(\lambda+1)x = 3$$
$$\boxed{x = \frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y = 0 \,/:2$$
$$y-1+\lambda y = 0$$
$$(\lambda+1)y = 1$$
$$\boxed{y = \frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z = 0 \,/:2$$
$$z+1+\lambda z = 0$$

$$\begin{aligned} 2(x-3)+2\lambda x &= 0 \\ 2(y-1)+2\lambda y &= 0 \\ 2(z+1)+2\lambda z &= 0 \\ x^2+y^2+z^2-4 &= 0 \end{aligned}$$

$$2(x-3)+2\lambda x=0 \;/:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0 \;/:2$$
$$y-1+\lambda y=0$$
$$(\lambda+1)y=1$$
$$\boxed{y=\frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z=0 \;/:2$$
$$z+1+\lambda z=0$$
$$(\lambda+1)z=-1$$

$$\begin{aligned} 2(x-3)+2\lambda x&=0\\ 2(y-1)+2\lambda y&=0\\ 2(z+1)+2\lambda z&=0\\ x^2+y^2+z^2-4&=0 \end{aligned}$$

$$2(x-3)+2\lambda x = 0 \;/:2$$
$$x - 3 + \lambda x = 0$$
$$(\lambda+1)x = 3$$
$$\boxed{x = \frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y = 0 \;/:2$$
$$y - 1 + \lambda y = 0$$
$$(\lambda+1)y = 1$$
$$\boxed{y = \frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z = 0 \;/:2$$
$$z + 1 + \lambda z = 0$$
$$(\lambda+1)z = -1$$
$$z = \frac{-1}{\lambda+1}$$

$$2(x-3)+2\lambda x = 0$$
$$2(y-1)+2\lambda y = 0$$
$$2(z+1)+2\lambda z = 0$$
$$x^2+y^2+z^2-4 = 0$$

$$2(x-3)+2\lambda x=0 \;/:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0 \;/:2$$
$$y-1+\lambda y=0$$
$$(\lambda+1)y=1$$
$$\boxed{y=\frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z=0 \;/:2$$
$$z+1+\lambda z=0$$
$$(\lambda+1)z=-1$$
$$\boxed{z=\frac{-1}{\lambda+1}}$$

$$\begin{aligned} 2(x-3)+2\lambda x&=0\\ 2(y-1)+2\lambda y&=0\\ 2(z+1)+2\lambda z&=0\\ x^2+y^2+z^2-4&=0 \end{aligned}$$

$$2(x-3)+2\lambda x=0 \,/:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0 \,/:2$$
$$y-1+\lambda y=0$$
$$(\lambda+1)y=1$$
$$\boxed{y=\frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z=0 \,/:2$$
$$z+1+\lambda z=0$$
$$(\lambda+1)z=-1$$
$$\boxed{z=\frac{-1}{\lambda+1}}$$

$$x^2+y^2+z^2=4$$

$$\begin{aligned} 2(x-3)+2\lambda x&=0\\ 2(y-1)+2\lambda y&=0\\ 2(z+1)+2\lambda z&=0\\ x^2+y^2+z^2-4&=0 \end{aligned}$$

$$2(x-3)+2\lambda x=0 \;/:2$$

$$x-3+\lambda x=0$$

$$(\lambda+1)x=3$$

$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0 \;/:2$$

$$y-1+\lambda y=0$$

$$(\lambda+1)y=1$$

$$\boxed{y=\frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z=0 \;/:2$$

$$z+1+\lambda z=0$$

$$(\lambda+1)z=-1$$

$$\boxed{z=\frac{-1}{\lambda+1}}$$

$$x^2+y^2+z^2=4$$

$$\tfrac{9}{(\lambda+1)^2}$$

$$\begin{aligned} 2(x-3)+2\lambda x&=0\\ 2(y-1)+2\lambda y&=0\\ 2(z+1)+2\lambda z&=0\\ x^2+y^2+z^2-4&=0 \end{aligned}$$

$$2(x-3)+2\lambda x=0 \,/:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0 \,/:2$$
$$y-1+\lambda y=0$$
$$(\lambda+1)y=1$$
$$\boxed{y=\frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z=0 \,/:2$$
$$z+1+\lambda z=0$$
$$(\lambda+1)z=-1$$
$$\boxed{z=\frac{-1}{\lambda+1}}$$

$$x^2+y^2+z^2=4$$
$$\frac{9}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}$$

$$\begin{aligned} 2(x-3)+2\lambda x&=0\\ 2(y-1)+2\lambda y&=0\\ 2(z+1)+2\lambda z&=0\\ x^2+y^2+z^2-4&=0 \end{aligned}$$

$$2(x-3)+2\lambda x = 0 \;/:2$$
$$x-3+\lambda x = 0$$
$$(\lambda+1)x = 3$$
$$\boxed{x = \frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y = 0 \;/:2$$
$$y-1+\lambda y = 0$$
$$(\lambda+1)y = 1$$
$$\boxed{y = \frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z = 0 \;/:2$$
$$z+1+\lambda z = 0$$
$$(\lambda+1)z = -1$$
$$\boxed{z = \frac{-1}{\lambda+1}}$$

$$x^2+y^2+z^2 = 4$$
$$\frac{9}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}$$

$$2(x-3)+2\lambda x = 0$$
$$2(y-1)+2\lambda y = 0$$
$$2(z+1)+2\lambda z = 0$$
$$x^2+y^2+z^2-4 = 0$$

$$2(x-3)+2\lambda x=0 \;/:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0 \;/:2$$
$$y-1+\lambda y=0$$
$$(\lambda+1)y=1$$
$$\boxed{y=\frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z=0 \;/:2$$
$$z+1+\lambda z=0$$
$$(\lambda+1)z=-1$$
$$\boxed{z=\frac{-1}{\lambda+1}}$$

$$x^2+y^2+z^2=4$$
$$\frac{9}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}=4$$

$$2(x-3)+2\lambda x=0$$
$$2(y-1)+2\lambda y=0$$
$$2(z+1)+2\lambda z=0$$
$$x^2+y^2+z^2-4=0$$

$$2(x-3)+2\lambda x = 0 \;/:2$$
$$x-3+\lambda x = 0$$
$$(\lambda+1)x = 3$$
$$\boxed{x = \frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y = 0 \;/:2$$
$$y-1+\lambda y = 0$$
$$(\lambda+1)y = 1$$
$$\boxed{y = \frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z = 0 \;/:2$$
$$z+1+\lambda z = 0$$
$$(\lambda+1)z = -1$$
$$\boxed{z = \frac{-1}{\lambda+1}}$$

$$x^2+y^2+z^2 = 4$$
$$\frac{9}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2} = 4$$
$$\frac{11}{(\lambda+1)^2} = 4$$

$$\begin{aligned} 2(x-3)+2\lambda x &= 0 \\ 2(y-1)+2\lambda y &= 0 \\ 2(z+1)+2\lambda z &= 0 \\ x^2+y^2+z^2-4 &= 0 \end{aligned}$$

$$2(x-3)+2\lambda x = 0 \;/:2$$
$$x-3+\lambda x = 0$$
$$(\lambda+1)x = 3$$
$$\boxed{x = \frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y = 0 \;/:2$$
$$y-1+\lambda y = 0$$
$$(\lambda+1)y = 1$$
$$\boxed{y = \frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z = 0 \;/:2$$
$$z+1+\lambda z = 0$$
$$(\lambda+1)z = -1$$
$$\boxed{z = \frac{-1}{\lambda+1}}$$

$$x^2+y^2+z^2 = 4$$
$$\frac{9}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2} = 4$$
$$\frac{11}{(\lambda+1)^2} = 4$$
$$(\lambda+1)^2 = \frac{11}{4}$$

$$2(x-3)+2\lambda x = 0$$
$$2(y-1)+2\lambda y = 0$$
$$2(z+1)+2\lambda z = 0$$
$$x^2+y^2+z^2-4 = 0$$

$$2(x-3)+2\lambda x=0\;/:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0\;/:2$$
$$y-1+\lambda y=0$$
$$(\lambda+1)y=1$$
$$\boxed{y=\frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z=0\;/:2$$
$$z+1+\lambda z=0$$
$$(\lambda+1)z=-1$$
$$\boxed{z=\frac{-1}{\lambda+1}}$$

$$2(x-3)+2\lambda x=0$$
$$2(y-1)+2\lambda y=0$$
$$2(z+1)+2\lambda z=0$$
$$x^2+y^2+z^2-4=0$$

$$x^2+y^2+z^2=4$$
$$\frac{9}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}=4$$
$$\frac{11}{(\lambda+1)^2}=4$$
$$(\lambda+1)^2=\frac{11}{4}$$
$$\lambda+1=\pm\frac{\sqrt{11}}{2}$$

$$2(x-3)+2\lambda x=0 \;/:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0 \;/:2$$
$$y-1+\lambda y=0$$
$$(\lambda+1)y=1$$
$$\boxed{y=\frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z=0 \;/:2$$
$$z+1+\lambda z=0$$
$$(\lambda+1)z=-1$$
$$\boxed{z=\frac{-1}{\lambda+1}}$$

$$x^2+y^2+z^2=4$$
$$\frac{9}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}=4$$
$$\frac{11}{(\lambda+1)^2}=4$$
$$(\lambda+1)^2=\frac{11}{4}$$
$$\lambda+1=\pm\frac{\sqrt{11}}{2}$$

$$\lambda_1=\frac{-2+\sqrt{11}}{2}$$

$$2(x-3)+2\lambda x=0$$
$$2(y-1)+2\lambda y=0$$
$$2(z+1)+2\lambda z=0$$
$$x^2+y^2+z^2-4=0$$

$$2(x-3)+2\lambda x = 0 \,/:2$$
$$x-3+\lambda x = 0$$
$$(\lambda+1)x = 3$$
$$\boxed{x = \frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y = 0 \,/:2$$
$$y-1+\lambda y = 0$$
$$(\lambda+1)y = 1$$
$$\boxed{y = \frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z = 0 \,/:2$$
$$z+1+\lambda z = 0$$
$$(\lambda+1)z = -1$$
$$\boxed{z = \frac{-1}{\lambda+1}}$$

$$x^2+y^2+z^2 = 4$$
$$\frac{9}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2} = 4$$
$$\frac{11}{(\lambda+1)^2} = 4$$
$$(\lambda+1)^2 = \frac{11}{4}$$
$$\lambda+1 = \pm\frac{\sqrt{11}}{2}$$

$$\lambda_1 = \frac{-2+\sqrt{11}}{2}$$
$$\lambda_2 = \frac{-2-\sqrt{11}}{2}$$

$$\begin{aligned} 2(x-3)+2\lambda x &= 0 \\ 2(y-1)+2\lambda y &= 0 \\ 2(z+1)+2\lambda z &= 0 \\ x^2+y^2+z^2-4 &= 0 \end{aligned}$$

$$2(x-3)+2\lambda x=0 \;/:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0 \;/:2$$
$$y-1+\lambda y=0$$
$$(\lambda+1)y=1$$
$$\boxed{y=\frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z=0 \;/:2$$
$$z+1+\lambda z=0$$
$$(\lambda+1)z=-1$$
$$\boxed{z=\frac{-1}{\lambda+1}}$$

$$x^2+y^2+z^2=4$$
$$\frac{9}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}=4$$
$$\frac{11}{(\lambda+1)^2}=4$$
$$(\lambda+1)^2=\frac{11}{4}$$
$$\lambda+1=\pm\frac{\sqrt{11}}{2}$$

$$\boxed{\begin{aligned}\lambda_1&=\frac{-2+\sqrt{11}}{2}\\ \lambda_2&=\frac{-2-\sqrt{11}}{2}\end{aligned}}$$

$$\begin{aligned}2(x-3)+2\lambda x&=0\\ 2(y-1)+2\lambda y&=0\\ 2(z+1)+2\lambda z&=0\\ x^2+y^2+z^2-4&=0\end{aligned}$$

$$2(x-3)+2\lambda x=0 \;/:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0 \;/:2$$
$$y-1+\lambda y=0$$
$$(\lambda+1)y=1$$
$$\boxed{y=\frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z=0 \;/:2$$
$$z+1+\lambda z=0$$
$$(\lambda+1)z=-1$$
$$\boxed{z=\frac{-1}{\lambda+1}}$$

$$x^2+y^2+z^2=4$$
$$\frac{9}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}=4$$
$$\frac{11}{(\lambda+1)^2}=4$$
$$(\lambda+1)^2=\frac{11}{4}$$
$$\lambda+1=\pm\frac{\sqrt{11}}{2}$$

$$\boxed{\lambda_1=\frac{-2+\sqrt{11}}{2} \qquad \lambda_2=\frac{-2-\sqrt{11}}{2}}$$

$$2(x-3)+2\lambda x = 0 \; / : 2$$
$$x - 3 + \lambda x = 0$$
$$(\lambda+1)x = 3$$
$$\boxed{x = \frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y = 0 \; / : 2$$
$$y - 1 + \lambda y = 0$$
$$(\lambda+1)y = 1$$
$$\boxed{y = \frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z = 0 \; / : 2$$
$$z + 1 + \lambda z = 0$$
$$(\lambda+1)z = -1$$
$$\boxed{z = \frac{-1}{\lambda+1}}$$

$$x^2+y^2+z^2 = 4$$
$$\frac{9}{(\lambda+1)^2} + \frac{1}{(\lambda+1)^2} + \frac{1}{(\lambda+1)^2} = 4$$
$$\frac{11}{(\lambda+1)^2} = 4$$
$$(\lambda+1)^2 = \frac{11}{4}$$
$$\lambda + 1 = \pm\frac{\sqrt{11}}{2}$$

$$\boxed{\lambda_1 = \frac{-2+\sqrt{11}}{2} \qquad \lambda_2 = \frac{-2-\sqrt{11}}{2}}$$

Stacionarne točke

$$2(x-3)+2\lambda x=0\ /:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0\ /:2$$
$$y-1+\lambda y=0$$
$$(\lambda+1)y=1$$
$$\boxed{y=\frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z=0\ /:2$$
$$z+1+\lambda z=0$$
$$(\lambda+1)z=-1$$
$$\boxed{z=\frac{-1}{\lambda+1}}$$

$$x^2+y^2+z^2=4$$
$$\frac{9}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}=4$$
$$\frac{11}{(\lambda+1)^2}=4$$
$$(\lambda+1)^2=\frac{11}{4}$$
$$\lambda+1=\pm\frac{\sqrt{11}}{2}$$

$$\boxed{\begin{aligned}\lambda_1&=\frac{-2+\sqrt{11}}{2}\\ \lambda_2&=\frac{-2-\sqrt{11}}{2}\end{aligned}}$$

Stacionarne točke

$$T_1\left(\frac{6}{\sqrt{11}},\frac{2}{\sqrt{11}},-\frac{2}{\sqrt{11}}\right)$$

$$2(x-3)+2\lambda x = 0 \;/:2$$
$$x-3+\lambda x = 0$$
$$(\lambda+1)x = 3$$
$$\boxed{x = \frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y = 0 \;/:2$$
$$y-1+\lambda y = 0$$
$$(\lambda+1)y = 1$$
$$\boxed{y = \frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z = 0 \;/:2$$
$$z+1+\lambda z = 0$$
$$(\lambda+1)z = -1$$
$$\boxed{z = \frac{-1}{\lambda+1}}$$

$$x^2+y^2+z^2 = 4$$
$$\frac{9}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2} = 4$$
$$\frac{11}{(\lambda+1)^2} = 4$$
$$(\lambda+1)^2 = \frac{11}{4}$$
$$\lambda+1 = \pm\frac{\sqrt{11}}{2}$$

$$\lambda_1 = \frac{-2+\sqrt{11}}{2}$$
$$\lambda_2 = \frac{-2-\sqrt{11}}{2}$$

Stacionarne točke

$$T_1\left(\underset{x_1}{\frac{6}{\sqrt{11}}}, \underset{y_1}{\frac{2}{\sqrt{11}}}, \underset{z_1}{-\frac{2}{\sqrt{11}}}\right)$$

$$2(x-3)+2\lambda x = 0 \;/:2$$
$$x-3+\lambda x = 0$$
$$(\lambda+1)x = 3$$
$$\boxed{x = \frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y = 0 \;/:2$$
$$y-1+\lambda y = 0$$
$$(\lambda+1)y = 1$$
$$\boxed{y = \frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z = 0 \;/:2$$
$$z+1+\lambda z = 0$$
$$(\lambda+1)z = -1$$
$$\boxed{z = \frac{-1}{\lambda+1}}$$

$$x^2+y^2+z^2 = 4$$
$$\frac{9}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2} = 4$$
$$\frac{11}{(\lambda+1)^2} = 4$$
$$(\lambda+1)^2 = \frac{11}{4}$$
$$\lambda+1 = \pm\frac{\sqrt{11}}{2}$$

$$\boxed{\lambda_1 = \frac{-2+\sqrt{11}}{2} \qquad \lambda_2 = \frac{-2-\sqrt{11}}{2}}$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{6}{\sqrt{11}}}, \overset{y_1}{\frac{2}{\sqrt{11}}}, \overset{z_1}{-\frac{2}{\sqrt{11}}}\right) \qquad T_2\left(-\frac{6}{\sqrt{11}}, -\frac{2}{\sqrt{11}}, \frac{2}{\sqrt{11}}\right)$$

$$2(x-3)+2\lambda x=0 \;/:2$$
$$x-3+\lambda x=0$$
$$(\lambda+1)x=3$$
$$\boxed{x=\frac{3}{\lambda+1}}$$

$$2(y-1)+2\lambda y=0 \;/:2$$
$$y-1+\lambda y=0$$
$$(\lambda+1)y=1$$
$$\boxed{y=\frac{1}{\lambda+1}}$$

$$2(z+1)+2\lambda z=0 \;/:2$$
$$z+1+\lambda z=0$$
$$(\lambda+1)z=-1$$
$$\boxed{z=\frac{-1}{\lambda+1}}$$

$$x^2+y^2+z^2=4$$
$$\frac{9}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}+\frac{1}{(\lambda+1)^2}=4$$
$$\frac{11}{(\lambda+1)^2}=4$$
$$(\lambda+1)^2=\frac{11}{4}$$
$$\lambda+1=\pm\frac{\sqrt{11}}{2}$$

$$\boxed{\lambda_1=\frac{-2+\sqrt{11}}{2} \qquad \lambda_2=\frac{-2-\sqrt{11}}{2}}$$

Stacionarne točke

$$T_1\left(\underset{x_1}{\frac{6}{\sqrt{11}}},\ \underset{y_1}{\frac{2}{\sqrt{11}}},\ \underset{z_1}{-\frac{2}{\sqrt{11}}}\right) \qquad T_2\left(\underset{x_2}{-\frac{6}{\sqrt{11}}},\ \underset{y_2}{-\frac{2}{\sqrt{11}}},\ \underset{z_2}{\frac{2}{\sqrt{11}}}\right)$$

Stacionarne točke

$$T_1\left(\overset{\color{blue}{x_1}}{\frac{6}{\sqrt{11}}}, \overset{\color{blue}{y_1}}{\frac{2}{\sqrt{11}}}, \overset{\color{blue}{z_1}}{-\frac{2}{\sqrt{11}}}\right) \qquad T_2\left(\overset{\color{blue}{x_2}}{-\frac{6}{\sqrt{11}}}, \overset{\color{blue}{y_2}}{-\frac{2}{\sqrt{11}}}, \overset{\color{blue}{z_2}}{\frac{2}{\sqrt{11}}}\right)$$

$$f(x, y, z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{6}{\sqrt{11}}}, \overset{y_1}{\frac{2}{\sqrt{11}}}, -\overset{z_1}{\frac{2}{\sqrt{11}}}\right) \qquad T_2\left(-\overset{x_2}{\frac{6}{\sqrt{11}}}, -\overset{y_2}{\frac{2}{\sqrt{11}}}, \overset{z_2}{\frac{2}{\sqrt{11}}}\right)$$

$$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$

$$x^2 + y^2 + z^2 = 4$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{6}{\sqrt{11}}}, \overset{y_1}{\frac{2}{\sqrt{11}}}, -\overset{z_1}{\frac{2}{\sqrt{11}}}\right) \qquad T_2\left(-\overset{x_2}{\frac{6}{\sqrt{11}}}, -\overset{y_2}{\frac{2}{\sqrt{11}}}, \overset{z_2}{\frac{2}{\sqrt{11}}}\right)$$

$$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$

$$x^2 + y^2 + z^2 = 4$$

sfera je kompaktni skup u $\mathbb{R}^3$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{6}{\sqrt{11}}}, \overset{y_1}{\frac{2}{\sqrt{11}}}, \overset{z_1}{-\frac{2}{\sqrt{11}}}\right) \qquad T_2\left(\overset{x_2}{-\frac{6}{\sqrt{11}}}, \overset{y_2}{-\frac{2}{\sqrt{11}}}, \overset{z_2}{\frac{2}{\sqrt{11}}}\right)$$

$$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$ ← neprekidna funkcija

$$x^2 + y^2 + z^2 = 4$$

sfera je kompaktni skup u $\mathbb{R}^3$

Stacionarne točke

$$T_1\left(\underbrace{\frac{6}{\sqrt{11}}}_{x_1}, \underbrace{\frac{2}{\sqrt{11}}}_{y_1}, \underbrace{-\frac{2}{\sqrt{11}}}_{z_1}\right) \qquad T_2\left(\underbrace{-\frac{6}{\sqrt{11}}}_{x_2}, \underbrace{-\frac{2}{\sqrt{11}}}_{y_2}, \underbrace{\frac{2}{\sqrt{11}}}_{z_2}\right)$$

$$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2 \longleftarrow$$ neprekidna funkcija

$$x^2 + y^2 + z^2 = 4$$

sfera je kompaktni skup u $\mathbb{R}^3$

$$f\left(\frac{6}{\sqrt{11}},\ \frac{2}{\sqrt{11}},\ -\frac{2}{\sqrt{11}}\right) =$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{6}{\sqrt{11}}}, \overset{y_1}{\frac{2}{\sqrt{11}}}, \overset{z_1}{-\frac{2}{\sqrt{11}}}\right) \qquad T_2\left(\overset{x_2}{-\frac{6}{\sqrt{11}}}, \overset{y_2}{-\frac{2}{\sqrt{11}}}, \overset{z_2}{\frac{2}{\sqrt{11}}}\right)$$

$$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2 \longleftarrow$$ neprekidna funkcija

$$x^2 + y^2 + z^2 = 4$$

sfera je kompaktni skup u $\mathbb{R}^3$

$$f\left(\frac{6}{\sqrt{11}},\ \frac{2}{\sqrt{11}},\ -\frac{2}{\sqrt{11}}\right) = 15 - 4\sqrt{11}$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{6}{\sqrt{11}}}, \overset{y_1}{\frac{2}{\sqrt{11}}}, -\overset{z_1}{\frac{2}{\sqrt{11}}}\right) \qquad T_2\left(-\overset{x_2}{\frac{6}{\sqrt{11}}}, -\overset{y_2}{\frac{2}{\sqrt{11}}}, \overset{z_2}{\frac{2}{\sqrt{11}}}\right)$$

$$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2 \leftarrow$$ neprekidna funkcija

$$x^2 + y^2 + z^2 = 4$$

sfera je kompaktni skup u $\mathbb{R}^3$

$$f\left(\frac{6}{\sqrt{11}},\ \frac{2}{\sqrt{11}},\ -\frac{2}{\sqrt{11}}\right) = 15 - 4\sqrt{11}$$

$$f\left(-\frac{6}{\sqrt{11}},\ -\frac{2}{\sqrt{11}},\ \frac{2}{\sqrt{11}}\right) =$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{6}{\sqrt{11}}}, \overset{y_1}{\frac{2}{\sqrt{11}}}, \overset{z_1}{-\frac{2}{\sqrt{11}}}\right) \qquad T_2\left(\overset{x_2}{-\frac{6}{\sqrt{11}}}, \overset{y_2}{-\frac{2}{\sqrt{11}}}, \overset{z_2}{\frac{2}{\sqrt{11}}}\right)$$

$$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$ ← neprekidna funkcija

$$x^2 + y^2 + z^2 = 4$$ ← sfera je kompaktni skup u $\mathbb{R}^3$

$$f\left(\frac{6}{\sqrt{11}},\ \frac{2}{\sqrt{11}},\ -\frac{2}{\sqrt{11}}\right) = 15 - 4\sqrt{11}$$

$$f\left(-\frac{6}{\sqrt{11}},\ -\frac{2}{\sqrt{11}},\ \frac{2}{\sqrt{11}}\right) = 15 + 4\sqrt{11}$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{6}{\sqrt{11}}}, \overset{y_1}{\frac{2}{\sqrt{11}}}, \overset{z_1}{-\frac{2}{\sqrt{11}}}\right) \qquad T_2\left(\overset{x_2}{-\frac{6}{\sqrt{11}}}, \overset{y_2}{-\frac{2}{\sqrt{11}}}, \overset{z_2}{\frac{2}{\sqrt{11}}}\right)$$

$$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$ ← neprekidna funkcija

$$d = \sqrt{(x-3)^2 + (y-1)^2 + (z+1)^2}$$

$$x^2 + y^2 + z^2 = 4$$ ← sfera je kompaktni skup u $\mathbb{R}^3$

$$f\left(\frac{6}{\sqrt{11}},\ \frac{2}{\sqrt{11}},\ -\frac{2}{\sqrt{11}}\right) = 15 - 4\sqrt{11}$$

$$f\left(-\frac{6}{\sqrt{11}},\ -\frac{2}{\sqrt{11}},\ \frac{2}{\sqrt{11}}\right) = 15 + 4\sqrt{11}$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{6}{\sqrt{11}}}, \overset{y_1}{\frac{2}{\sqrt{11}}}, \overset{z_1}{-\frac{2}{\sqrt{11}}}\right) \qquad T_2\left(\overset{x_2}{-\frac{6}{\sqrt{11}}}, \overset{y_2}{-\frac{2}{\sqrt{11}}}, \overset{z_2}{\frac{2}{\sqrt{11}}}\right)$$

$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2$ ← neprekidna funkcija

$d = \sqrt{(x-3)^2 + (y-1)^2 + (z+1)^2}$

$x^2 + y^2 + z^2 = 4$

sfera je kompaktni skup u $\mathbb{R}^3$

$$f\left(\frac{6}{\sqrt{11}}, \frac{2}{\sqrt{11}}, -\frac{2}{\sqrt{11}}\right) = 15 - 4\sqrt{11} \rightsquigarrow d_1 = \sqrt{15 - 4\sqrt{11}}$$

$$f\left(-\frac{6}{\sqrt{11}}, -\frac{2}{\sqrt{11}}, \frac{2}{\sqrt{11}}\right) = 15 + 4\sqrt{11}$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{6}{\sqrt{11}}}, \overset{y_1}{\frac{2}{\sqrt{11}}}, \overset{z_1}{-\frac{2}{\sqrt{11}}}\right) \qquad T_2\left(\overset{x_2}{-\frac{6}{\sqrt{11}}}, \overset{y_2}{-\frac{2}{\sqrt{11}}}, \overset{z_2}{\frac{2}{\sqrt{11}}}\right)$$

$$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$ ← neprekidna funkcija

$$d = \sqrt{(x-3)^2 + (y-1)^2 + (z+1)^2}$$

$$x^2 + y^2 + z^2 = 4$$

sfera je kompaktni skup u $\mathbb{R}^3$

$$f\left(\frac{6}{\sqrt{11}},\ \frac{2}{\sqrt{11}},\ -\frac{2}{\sqrt{11}}\right) = 15 - 4\sqrt{11} \rightsquigarrow d_1 = \sqrt{15 - 4\sqrt{11}} \approx 1.32$$

$$f\left(-\frac{6}{\sqrt{11}},\ -\frac{2}{\sqrt{11}},\ \frac{2}{\sqrt{11}}\right) = 15 + 4\sqrt{11}$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{6}{\sqrt{11}}}, \overset{y_1}{\frac{2}{\sqrt{11}}}, \overset{z_1}{-\frac{2}{\sqrt{11}}}\right) \qquad T_2\left(\overset{x_2}{-\frac{6}{\sqrt{11}}}, \overset{y_2}{-\frac{2}{\sqrt{11}}}, \overset{z_2}{\frac{2}{\sqrt{11}}}\right)$$

$$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$

neprekidna funkcija

$$d = \sqrt{(x-3)^2 + (y-1)^2 + (z+1)^2}$$

$$x^2 + y^2 + z^2 = 4$$

sfera je kompaktni skup u $\mathbb{R}^3$

$$f\left(\frac{6}{\sqrt{11}}, \frac{2}{\sqrt{11}}, -\frac{2}{\sqrt{11}}\right) = 15 - 4\sqrt{11} \rightsquigarrow d_1 = \sqrt{15 - 4\sqrt{11}} \approx 1.32$$

$$f\left(-\frac{6}{\sqrt{11}}, -\frac{2}{\sqrt{11}}, \frac{2}{\sqrt{11}}\right) = 15 + 4\sqrt{11} \rightsquigarrow d_2 = \sqrt{15 + 4\sqrt{11}}$$

Stacionarne točke

$$T_1\left(\underbrace{\frac{6}{\sqrt{11}}}_{x_1}, \underbrace{\frac{2}{\sqrt{11}}}_{y_1}, \underbrace{-\frac{2}{\sqrt{11}}}_{z_1}\right) \qquad T_2\left(\underbrace{-\frac{6}{\sqrt{11}}}_{x_2}, \underbrace{-\frac{2}{\sqrt{11}}}_{y_2}, \underbrace{\frac{2}{\sqrt{11}}}_{z_2}\right)$$

$$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$ ← neprekidna funkcija

$$d = \sqrt{(x-3)^2 + (y-1)^2 + (z+1)^2}$$

$$x^2 + y^2 + z^2 = 4$$ ← sfera je kompaktni skup u $\mathbb{R}^3$

$$f\left(\frac{6}{\sqrt{11}},\ \frac{2}{\sqrt{11}},\ -\frac{2}{\sqrt{11}}\right) = 15 - 4\sqrt{11} \rightsquigarrow d_1 = \sqrt{15 - 4\sqrt{11}} \approx 1.32$$

$$f\left(-\frac{6}{\sqrt{11}},\ -\frac{2}{\sqrt{11}},\ \frac{2}{\sqrt{11}}\right) = 15 + 4\sqrt{11} \rightsquigarrow d_2 = \sqrt{15 + 4\sqrt{11}} \approx 5.32$$

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{6}{\sqrt{11}}}, \overset{y_1}{\frac{2}{\sqrt{11}}}, \overset{z_1}{-\frac{2}{\sqrt{11}}}\right) \qquad T_2\left(\overset{x_2}{-\frac{6}{\sqrt{11}}}, \overset{y_2}{-\frac{2}{\sqrt{11}}}, \overset{z_2}{\frac{2}{\sqrt{11}}}\right)$$

$$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$

neprekidna funkcija

$$d = \sqrt{(x-3)^2 + (y-1)^2 + (z+1)^2}$$

$$x^2 + y^2 + z^2 = 4$$

sfera je kompaktni skup u $\mathbb{R}^3$

$$f\left(\frac{6}{\sqrt{11}}, \frac{2}{\sqrt{11}}, -\frac{2}{\sqrt{11}}\right) = 15 - 4\sqrt{11} \rightsquigarrow d_1 = \sqrt{15 - 4\sqrt{11}} \approx 1.32$$

$$f\left(-\frac{6}{\sqrt{11}}, -\frac{2}{\sqrt{11}}, \frac{2}{\sqrt{11}}\right) = 15 + 4\sqrt{11} \rightsquigarrow d_2 = \sqrt{15 + 4\sqrt{11}} \approx 5.32$$

najbliža točka

Stacionarne točke

$$T_1\left(\underset{x_1}{\frac{6}{\sqrt{11}}}, \underset{y_1}{\frac{2}{\sqrt{11}}}, \underset{z_1}{-\frac{2}{\sqrt{11}}}\right) \qquad T_2\left(\underset{x_2}{-\frac{6}{\sqrt{11}}}, \underset{y_2}{-\frac{2}{\sqrt{11}}}, \underset{z_2}{\frac{2}{\sqrt{11}}}\right)$$

$$f(x,y,z) = (x-3)^2 + (y-1)^2 + (z+1)^2$$

neprekidna funkcija

$$d = \sqrt{(x-3)^2 + (y-1)^2 + (z+1)^2}$$

$$x^2 + y^2 + z^2 = 4$$

sfera je kompaktni skup u $\mathbb{R}^3$

$$f\left(\frac{6}{\sqrt{11}}, \frac{2}{\sqrt{11}}, -\frac{2}{\sqrt{11}}\right) = 15 - 4\sqrt{11} \rightsquigarrow d_1 = \sqrt{15 - 4\sqrt{11}} \approx 1.32$$

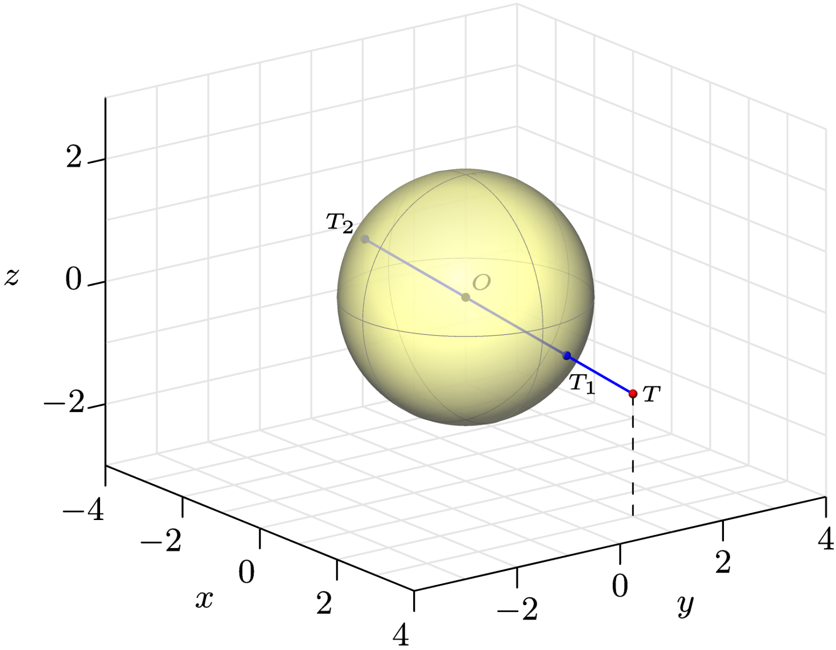
$$f\left(-\frac{6}{\sqrt{11}}, -\frac{2}{\sqrt{11}}, \frac{2}{\sqrt{11}}\right) = 15 + 4\sqrt{11} \rightsquigarrow d_2 = \sqrt{15 + 4\sqrt{11}} \approx 5.32$$

najbliža točka

najudaljenija točka

Stacionarne točke

$$T_1\left(\overset{x_1}{\frac{6}{\sqrt{11}}}, \overset{y_1}{\frac{2}{\sqrt{11}}}, \overset{z_1}{-\frac{2}{\sqrt{11}}}\right) \qquad T_2\left(\overset{x_2}{-\frac{6}{\sqrt{11}}}, \overset{y_2}{-\frac{2}{\sqrt{11}}}, \overset{z_2}{\frac{2}{\sqrt{11}}}\right)$$



2
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