

Rješavanje A sustava diferencijalnih jednadžbi

SUSTAV - A

prva jednadžba

$$r'' - \frac{1}{2} \sinh[2r] \theta' \left((1 + 4 (\sinh[r])^2) \theta' + 2 \phi' \right) = -\frac{1}{2} \sinh[2r] \theta'$$

druga jednadžba

$$\frac{1}{2} \sinh[2r] \theta'' + 2 (1 + 3 (\sinh[r])^2) r' \theta' + 2 r' \phi' = r'$$

treća jednadžba

$$\phi'' + (\sinh[r])^2 \theta'' + \sinh[2r] r' \theta' = 0$$

Integracijom treće jednadžbe dobijemo

$$\text{Integrate}[\phi''[t] + (\sinh[r])^2 \theta''[t] + \sinh[2r] r'[t] \times \theta'[t] = 0, t]$$

Set: Tag Plus in $\sinh[2r] r'[t] \theta'[t] + \sinh[r]^2 \theta''[t] + \phi''[t]$ is Protected.

Out[]:= 0

uvrstavanjem u prvu jednadzbu uz $C=1/2$ dobijemo

$$r'' - \frac{1}{4} \sinh[4r] (\theta')^2 = 0$$

uvrstavanjem u drugu jednadzbu dobijemo

$$\theta'' + 4 \coth[2r] r' \theta' = 0$$

separacijom varijabli slijedi

In[]:= Integrate[Coth[2r], r]

Out[]:= $\frac{1}{2} \log[\sinh[2r]]$

Provjera rješenja prve derivacije od theta

$$\text{In}[^{\circ}] := \text{TH}[r] = \frac{k}{(\text{Sinh}[2r])^2}$$

$$\text{Out}[^{\circ}] = k \text{Csch}[2r]^2$$

$$\text{In}[^{\circ}] := \text{D}[\text{TH}[r], r] + 4 \text{Coth}[2r] \text{TH}[r] // \text{FullSimplify}$$

$$\text{Out}[^{\circ}] = 0$$

uvrštavanjem u zadnju verziju prve jednadžbe dobijemo $r'' - \frac{\text{Cosh}[2r]}{2(\text{Sinh}[2r])^3} = 0$

$$\text{D Solve}\left[r''[t] - \frac{\text{Cosh}[2r[t]]}{2(\text{Sinh}[2r[t]])^3} == 0, r[t], t\right]$$

*** Solve: Warning: t is not a valid domain specification. Assuming it is a variable to eliminate.

*** Solve: Inverse functions are being used by Solve, so some solutions may not be found; use Reduce for complete solution information.

$$\text{Out}[^{\circ}] = \{ \}$$

$$\text{In}[^{\circ}] := \text{Integrate}\left[\frac{\text{Cosh}[2r]}{2(\text{Sinh}[2r])^3}, r\right]$$

$$\text{Out}[^{\circ}] = -\frac{1}{8} \text{Csch}[2r]^2$$

$$\text{In}[^{\circ}] := \text{Integrate}\left[-\frac{1}{8} \text{Csch}[2r]^2, r\right]$$

$$\text{Out}[^{\circ}] = \frac{1}{16} \text{Coth}[2r]$$