

$$L := 6 \text{ m} \quad S := 10 \text{ m} \quad H_L := 7 \text{ m} \quad H_R := 5 \text{ m} \quad m := 0.1 \text{ kg} \quad m_c := 0.1 \frac{\text{kg}}{\text{m}}$$

$$x := 4 \text{ m}$$

$$y(x, a, x_U, y_U) := a \cdot \cosh\left(\frac{x - x_U}{a}\right) - a + y_U$$

$$y'(x, a, x_U) := \frac{d}{dx} y(x, a, x_U, h) \rightarrow \sinh\left(\frac{x - x_U}{a}\right)$$

$$L_c(x_1, x_2, a, x_U) := \int_{x_1}^{x_2} \sqrt{1 + y'(x, a, x_U)^2} dx \rightarrow \frac{a \cdot \left(e^{\frac{x_U - x_1}{a}} + \left(e^{\frac{-x_U + x_2}{a}} - e^{\frac{-x_U + x_1}{a}} - e^{\frac{x_U - x_2}{a}} \right) \right)}{2}$$

$$y_{cg}(x_1, x_2, a, x_U, y_U) := \frac{\int_{x_1}^{x_2} y(x, a, x_U, y_U) \cdot \sqrt{1 + y'(x, a, x_U)^2} dx}{L_c(x_1, x_2, a, x_U)} \rightarrow \frac{a \cdot \left(a \cdot \text{li} \cdot \sin\left(\frac{2i \cdot (x_U - x_1)}{a}\right) + (2 \cdot a \cdot \dots) \right)}{L_c(x_1, x_2, a, x_U)}$$

$$PE(a, x_{UL}, y_{UL}, x_{UR}, y_{UR}) := m_c \cdot g \cdot L_c(0 \text{ m}, x, a, x_{UL}) \cdot y_{cg}(0 \text{ m}, x, a, x_{UL}, y_{UL}) + m \cdot g \cdot y(x, a, x_{UL}, y_{UL})$$

Ограничения приближения

$$a := 1 \frac{N}{m} \quad x_{UL} := 1 \text{ m} \quad y_{UL} := 1 \text{ m} \quad x_{UR} := 1 \text{ m} \quad y_{UR} := 1 \text{ m}$$

$$S = L_c(0 \text{ m}, x, a, x_{UL}) + L_c(x, L, a, x_{UR})$$

$$H_L = y(0 \text{ m}, a, x_{UL}, y_{UL}) \quad H_R = y(L, a, x_{UR}, y_{UR})$$

$$y(x, a, x_{UL}, y_{UL}) = y(x, a, x_{UR}, y_{UR})$$

Решатель

$$\begin{bmatrix} a \\ x_{UL} \\ y_{UL} \\ x_{UR} \\ y_{UR} \end{bmatrix} := \text{minimize}(PE, a, x_{UL}, y_{UL}, x_{UR}, y_{UR}) = \begin{bmatrix} 2.119 \\ 3.894 \\ 2.295 \\ 2.712 \\ 1.894 \end{bmatrix} \text{ m}$$

$$x_L := 0 \text{ m}, \frac{x}{300} \dots x$$

$$x_R := x, x + \frac{L - x}{300} \dots L$$

$$a = 2.119 \text{ m}$$

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$$\underline{y(x_L, a, x_{UL}, y_{UL}) (m)}$$

$$\underline{y(x_R, a, x_{UR}, y_{UR}) (m)}$$

$$\underline{y(x_R, a, x_{UL}, y_{UL}) (m)}$$

$$\underline{y(x_L, a, x_{UR}, y_{UR}) (m)}$$

