

$$Y_B := 40 \text{ mm} \quad J := 10 \text{ kg} \cdot \text{m}^2$$

$$s_B := 40 \text{ mm} \quad p := 6 \text{ mm} \quad \eta := 0.9$$

$$Y_A := 255 \text{ mm} \quad I_{bl} := 11 \text{ A} \quad M_{bl} := 2450 \text{ N} \cdot \text{mm}$$

$$s_A := 45 \text{ mm} \quad I_{leer} := 0.27 \text{ A} \quad n_{leer} := 352.57 \text{ min}^{-1}$$

clear sym($Y_B, J, Y_A, s_B, s_A, I_{bl}, M_{bl}, I_{leer}, n_{leer}, p, \eta$)

$$K := \sqrt{(Y_B \cdot \cos(0) - s_B \cdot \sin(0) + Y_A)^2 + (Y_B \cdot \sin(0) + s_B \cdot \cos(0) - s_A)^2} \quad K = 295.042 \text{ mm}$$

$$x(t, \varphi) := K - \sqrt{(Y_B \cdot \cos(\varphi(t)) - s_B \cdot \sin(\varphi(t)) - Y_A)^2 + (Y_B \cdot \sin(\varphi(t)) + s_B \cdot \cos(\varphi(t)) - s_A)^2}$$

$$n(t, \varphi) := \frac{1}{p} \cdot \frac{d}{dt} x(t, \varphi)$$

$$h(t, \varphi) := \frac{(Y_B \cdot \cos(\varphi(t)) - s_B \cdot \sin(\varphi(t)) + Y_A) \cdot s_A - (Y_B \cdot \sin(\varphi(t)) + s_B \cdot \cos(\varphi(t)) - s_A) \cdot (-Y_A)}{\sqrt{(Y_B \cdot \cos(\varphi(t)) - s_B \cdot \sin(\varphi(t)) + Y_A)^2 + (Y_B \cdot \sin(\varphi(t)) + s_B \cdot \cos(\varphi(t)) - s_A)^2}}$$

$$M(t, \varphi) := -\frac{M_{bl}}{n_{leer}} \cdot n(t, \varphi) + M_{bl}$$

$$F_A(t, \varphi) := \frac{2 \cdot \pi \cdot \eta}{p} \cdot M(t, \varphi)$$

$$h(t, \varphi_0) := h(t, \varphi) \xrightarrow{\text{substitute, } \varphi(t) = \varphi_0} \frac{s_A \cdot Y_B \cdot \cos(\varphi_0) + s_B \cdot Y_A \cdot \cos(\varphi_0) - s_A \cdot s_B \cdot \sin(\varphi_0) + Y_A \cdot Y_B \cdot \sin(\varphi_0)}{\sqrt{(Y_A + Y_B \cdot \cos(\varphi_0) - s_B \cdot \sin(\varphi_0))^2 + (s_B \cdot \cos(\varphi_0) - s_A + Y_B \cdot \sin(\varphi_0))^2}}$$

$$F_A(t, \varphi_0, \varphi_1) := F_A(t, \varphi) \xrightarrow{\begin{array}{l} \text{substitute, } \varphi(t) = \varphi_0 \\ \text{substitute, } \frac{d}{dt} \varphi(t) = \varphi_1 \end{array}} \frac{2 \cdot \pi \cdot \eta}{p} \cdot \left(M_{bl} + \frac{M_{bl}}{n_{leer}} \cdot (2 \cdot (\varphi_1 \cdot Y_B \cdot \cos(\varphi_0) - \varphi_1 \cdot s_B \cdot \sin(\varphi_0)) - \varphi_1 \cdot n_{leer}) \right)$$

$$t_{end} := 1.2 \text{ s}$$

Gleichungslöser Nebenbedingungsbedingte

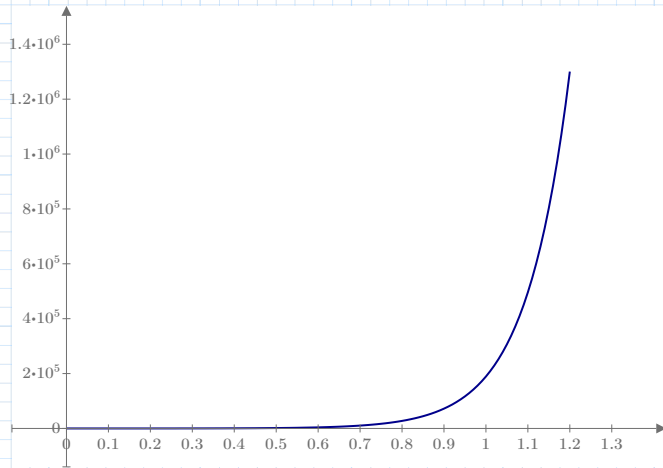
$$J \cdot \varphi''(t) = F_A(t, \varphi(t), \varphi'(t)) \cdot h(t, \varphi(t))$$

$$\varphi(0 \text{ s}) = 0^\circ$$

$$\varphi'(0 \text{ s}) = 0 \frac{\circ}{\text{s}}$$

$$\varphi := \text{odesolve}(\varphi(t), t_{end})$$

$t := 0 \text{ s}, 0.01 \text{ s} \dots t_{end}$



$$\varphi(1.2 \text{ s}) = 2.27 \cdot 10^4$$

$$\varphi(1.2 \text{ s}) = (1.301 \cdot 10^6) \text{ deg}$$

$$\underline{\varphi(t) \text{ (}^\circ\text{)}}$$

$$\underline{t \text{ (s)}}$$