Problem 7

$m_p := 0.8 \qquad m := 4.8 \qquad k := 600 \qquad c := 20$

$$u_{static} := \frac{m_p \cdot 9.8}{k} = 0.013$$

$$\omega_n := \sqrt{\frac{k}{m}}$$

$$\zeta := \frac{c}{2 \cdot m \cdot \omega_n} = 0.186$$

$$\omega_d := \omega_n \cdot \sqrt{1 - \zeta^2} = 10.985$$

$$k \cdot (u(t) + v_{static}) + c \cdot u'(t) + m \cdot u''(t) - m \cdot g = 0$$

Given the fact that:

$$k \cdot v_{static} = m \cdot g$$

$$k \cdot u(t) + c \cdot u'(t) + m \cdot u''(t) = 0$$

$$u(t) := e^{-\zeta \cdot \omega_n \cdot t} \cdot (A1 \cdot cos(\omega_d \cdot t) + A2 \cdot sin(\omega_d \cdot t))$$

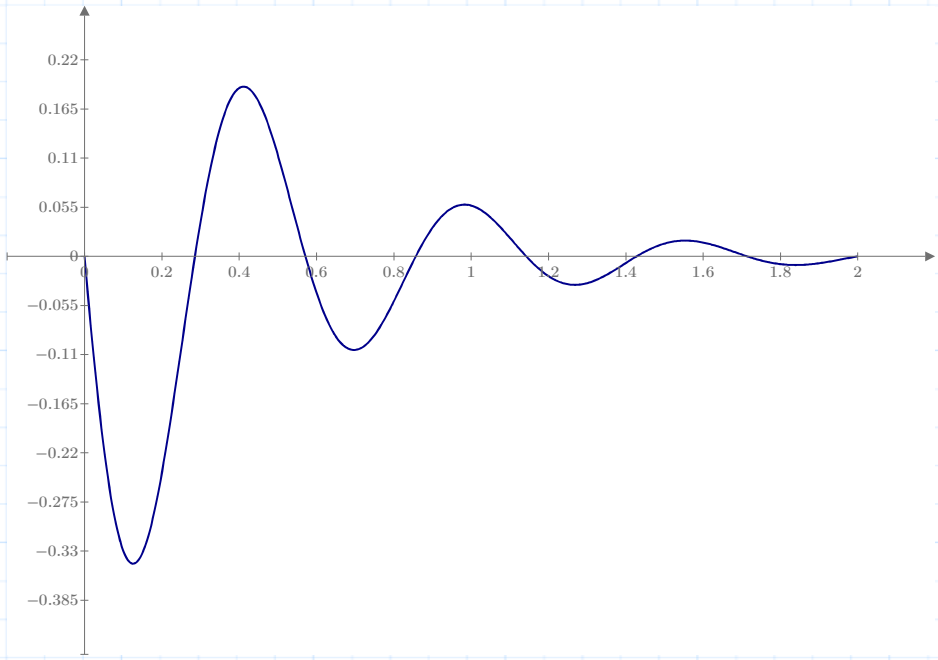
$$u0 := u(0) \rightarrow A1$$

$$v0 := \frac{d^1}{dt^1} u(t) \xrightarrow[float, 3]{substitute, t = 0} -2.08 \cdot A1 + 11.0 \cdot A2$$

$$[A1 \;\; A2] := \begin{bmatrix} u0 \\ v0 \end{bmatrix} = \begin{bmatrix} 0 \\ -5 \end{bmatrix} \xrightarrow[float, 3]{solve, A1, A2} [0 \;\; -0.455]$$

$$u(t) := e^{-\zeta \cdot \omega_n \cdot t} \cdot (A1 \cdot \cos(\omega_d \cdot t) + A2 \cdot \sin(\omega_d \cdot t)) \xrightarrow{float, 3} -0.455 \cdot e^{-2.08 \cdot t} \cdot \sin(11.0 \cdot t)$$

$$u(t) \rightarrow -0.455 \cdot e^{-2.08 \cdot t} \cdot \sin(11.0 \cdot t)$$



$u(t)$

t

Решатель
Ограничения
Параметры приближения

$t := 0$

$\frac{d}{dt} u(t) = 0$

$sol := \text{find}(t) = 0.126$

Решатель
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$n := 5$

$abs\left(u\left(0.126 + n \cdot \frac{\pi}{\omega_d}\right)\right) - abs(u(0.126) \cdot 0.05) = 0$

$sol := \text{find}(n) = 5.064$

How to constrain n as an integer in a solver block?