Ecuación Diferencial Lineal

$$M\frac{d^2s}{dt^2} = -\text{Hooke}\, s$$

$$\text{Masa} = \frac{0.035}{9.62}$$

$$\text{Hooke} = \frac{14.6}{0.3}$$

$$\frac{d^2s}{dt^2} + \frac{\text{Hooke}}{\text{Masa}}s = 0 \qquad \text{EDO(2)L cc H.}$$

$$\left(\frac{kg \cdot s^2}{m}\right)\cdot\left(\frac{m}{s^2}\right) = -\left(\frac{kg}{m}\right)\cdot(m)$$

$$\frac{H}{M} = \frac{\frac{14.6}{0.3}}{\frac{0.035}{9.62}}$$

$$kg = kg$$

$$\frac{d^2s}{dt^2} + 13,376.38\, s = 0$$

$$\frac{H}{M} = \frac{14.6 \times 9.62}{0.3 \times 0.035}$$

$$m^2 + 13,376.38 = 0$$

$$m = \pm\sqrt{13,376.38}\; i$$

$$m = \pm 115.656\, i$$

$$s(t) = C_1 \cos\left(115.656\, t\right) + C_2\, \text{Sen}\left(115.656\, t\right)$$

$$s(0) = -\left(0.73 - 0.23\right) = -0.5$$

$$s'(0) = 0$$

$$s(t) = C_1 \cos(115.656t) + C_2 \operatorname{sen}(115.656t)$$

$s(0) = -0.5 \qquad s'(0) = 0$

$$s'(t) = -115.656\, C_1 \operatorname{sen}(115.656t) + 115.656\, C_2 \cos(115.656t)$$

$$C_1 \cos(0) + C_2 \operatorname{sen}(0) = -0.5 \qquad \boxed{C_1 = -0.5}$$

$$-115.656\, C_1 \operatorname{sen}(0) + 115.656\, C_2 \cos(0) = 0 \qquad \boxed{C_2 = 0}$$

$$\boxed{s(t) = -0.5 \cos(115.656t)}$$

$$s'(t) = 57.828 \operatorname{sen}(115.656t)$$

$$-0.5 \cos(115.656t) = 0$$

$$\cos(115.656t) = 0$$

$$115.656t = \frac{\pi}{2}$$

$$t = \frac{3.1416}{2 \cdot 115.656} \Rightarrow 0.01358\ s$$

$$s'_{max} = 57.828 \operatorname{sen}(115.656 \times 0.01358)$$

$$= 57.828 \operatorname{sen}\left(\frac{\pi}{2}\right)$$

$$s'_{max} = 57.828\ \frac{m}{s}$$

$$= \frac{57.828 \times 3600}{1000} \Rightarrow 208\ \frac{km}{h}$$

$\frac{d^2y}{dt^2} = -g$ EDO(a) L cc NH.

MPV

$\frac{d^2y}{dt^2} = 0$

$m^2 = 0$

$m_1 = m_2 \Rightarrow 0$

$y_g = c_1 e^{m_1 t} + c_2 t e^{m_1 t}$

$y_g = C_1 + C_2 t$

$y_{n.h} = A(t) + B(t)\cdot t$

$y' = B(t) + (A'(t) + B'(t)\, t)$ ($A'(t) + B'(t) = 0$)

$y' = B(t) + (0)$

$y'' = B'(t) = Q(t)$

$A'(t) + B'(t)\cdot t = 0$

$B'(t) = -g$ $\quad B(t) = -g\int dt$

$A'(t) - gt = 0$ $\quad B(t) = -gt + C_2$

$A'(t) = gt$

$A(t) = g\int t\,dt \Rightarrow A(t) = \frac{g}{2}t^2 + C_1$

$y_{n.h} = A(t) + B(t)\cdot t$

$= \left(\frac{g}{2}t^2 + C_1\right) + \left(-gt + C_2\right)t$

$= -gt^2 + \frac{g}{2}t^2 + C_2 t + C_1$

$y = -\frac{g}{2}t^2 + C_2 t + C_1$

$y(0) = 2\ m \quad y'(0) = 52.828\left(\cos\left(\frac{\pi}{4}\right)\right)$

$= 40.89\ \frac{m}{s}$

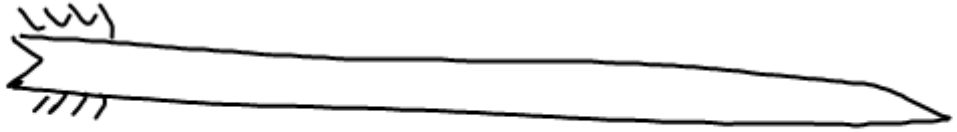
$y' = -gt + C_2$

$-\frac{g}{2}(0)^2 + C_2(0) + C_1 = 2 \quad C_1 = 2$

$-g(0) + C_2 = 40.89 \quad C_2 = 40.89$

$y(t) = -4.8\,t^2 + 40.89\,t + 2$

$$\frac{dx}{dt} = 40.89 \ \frac{m}{s}$$



$$dx = 40.89\,dt$$

$$\int dx = 40.89 \int dt$$

$$x = 40.89\,t + C_3$$

$$x(0) = 5 \text{ m.}$$

$$x = 40.89\,t + 5$$

$$y = -4{,}8\,t^2 + 40.89\,t + 2$$

$$-4{,}8\,t^2 + 40.89\,t + 2 = 0$$

$$t = \frac{-40.8 \pm \sqrt{(40.89)^2 - 4(-4.8)(2)}}{(-4.8)\cdot 2}$$

$$t_1 = 8.56 \quad s$$

$$t_2 = -0.004$$

$$x_{max} = 40.89\,(8.56) + 5 = 355 \quad m.$$

$\frac{d^3y}{dx^3} - 27y = 8e^{3x}$ EDO(3)L cc NH

$\frac{d^3y}{dx^3} - 27y = 0$

$m^3 - 27 = 0$

$(m-3)(m^2+3m+9) = 0$

$m_1 = 3$

$m_{2,3} = \frac{-3 \pm \sqrt{9-4(9)}}{2}$

$m_{2,3} = \frac{-3 \pm 3\sqrt{3}\,i}{2}$

$(m^3 \pm a^3) =$

$(m \pm a)(m^2 \mp am + a^2) =$

$\sqrt{9(1-4)}$

$\sqrt{9}\sqrt{-3}$

$y_g = C_1 e^{3x} + C_2 e^{-\frac{3}{2}x} \cos\left(\frac{3\sqrt{3}}{2}x\right) + C_3 e^{-\frac{3}{2}x} \operatorname{sen}\left(\frac{3\sqrt{3}}{2}x\right).$

$y_{np} = A(x) e^{3x} + B(x) e^{-\frac{3}{2}x} \cos\left(\frac{3\sqrt{3}}{2}x\right) + C(x) e^{-\frac{3}{2}x} \operatorname{sen}\left(\frac{3\sqrt{3}}{2}x\right).$

$$\begin{bmatrix} e^{3x} & e^{-\frac{3}{2}x}\cos\left(\frac{3\sqrt{3}}{2}x\right) & e^{-\frac{3}{2}x}\operatorname{sen}\left(\frac{3\sqrt{3}}{2}x\right) \\ 3e^{3x} & & \\ 9e^{3x} & & \end{bmatrix} \begin{bmatrix} A'(x) \\ B'(x) \\ C'(x) \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ Q(x) \end{bmatrix}$$