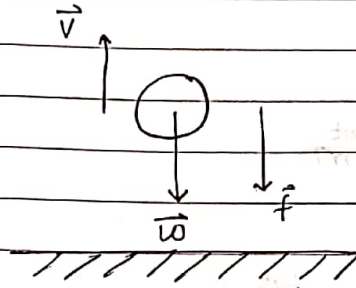


Nama = Alfia Rosa

NPM = 2013022040

Kelas = B

Meningjau Gerak vertikal keatas dibawah pengaruh gaya gesek kuadratik



$$\sum \vec{F} = m \cdot a$$

$$-\vec{w} \cdot \vec{F} = m \cdot a$$

$$-mg - bv^2 = m \cdot a$$

$$\int_{v_0}^{vt} \frac{dv}{-g - \frac{bv^2}{m}} = \int_0^t dt$$

$$\int_{v_0}^{vt} \frac{f}{v} \frac{dv}{-g - \frac{bv}{m}} = \int_0^t dt$$

misal $-g - \frac{bv}{m} = u$

$$-\frac{b}{m} dv = du$$

$$dv = \frac{m}{b} \cdot du$$

$$\int \frac{1}{u} \left(-\frac{m}{b} du \right) = -\frac{m}{b} \int \frac{1}{u} dv$$

$$\ln(u) = -\frac{m}{b} \ln(u)$$

$$\int_{v_0}^{vt} \frac{1}{-g - \frac{bv^2}{m}} dv = \int_0^t dt$$

$$-\frac{m}{bv} \ln(u) = t$$

$$-\frac{m}{bv} \ln \left[-g - \frac{bv^2}{m} \right]_{v_0}^{vt} = t$$

$$-\frac{m}{bv} \left(\ln \left| \frac{-g - \frac{bv^2}{m}}{-g - \frac{bv_0^2}{m}} \right| \right) = t$$

$$\frac{-g - \frac{bv^2}{m}}{-g - \frac{bv_0^2}{m}} = e^{-\frac{bv^2}{m}}$$

$$-g - \frac{b}{m} v_t = \left(-g - \frac{b}{m} v_0\right) e^{-\frac{b v^2}{m}}$$

$$v_t = -\frac{mg}{bv} - \left(-\frac{mg}{bv} - v_0\right) e^{-\frac{b v t}{m}}$$

$$f = -w$$

$$bv = mg$$

$$v_T = \frac{mg}{bv}$$

$$V(t) = v_T - (v_T - v_0) e^{-\frac{b v t}{m}}$$

$$a(t) = \frac{dv(t)}{dt}$$

$$= \frac{d}{dt} \left[v_T - (-v_0 + v_T) e^{-\frac{b v t}{m}} \right]$$

$$= 0 - (-v_0 + v_T) \left(-\frac{bv}{m}\right) e^{-\frac{b v t}{m}}$$

$$= \frac{bv}{m} (-v_0 + v_T) e^{-\frac{b v t}{m}}$$

$$= \frac{bv}{m} \left(v_0 + \frac{bv}{m} v_T \right) e^{-\frac{b v t}{m}}$$

$$= \left(\frac{bv}{m} \frac{mg}{bv} - \frac{bv}{m} v_0 \right) e^{-\frac{b v t}{m}}$$

$$a(t) = \left(-g - \frac{b}{m} v_0\right) e^{-\frac{b v t}{m}}$$

$$V(t) = \frac{dy(t)}{dt}$$

$$\int_{y_0}^{y_x} dy(t) = \int_0^t v(t) dt$$

$$y(t) = \int_0^t v_T - (-v_0 + v_T) e^{-\frac{b v t}{m}}$$

$$= \left[v_T t - (-v_0 + v_T) \left(-\frac{m}{bv}\right) e^{-\frac{b v t}{m}} \right]_0^t$$

$$= \left[v_T t - (-v_0 + v_T) \left(-\frac{m}{bv}\right) e^{-\frac{b v t}{m}} \right] - \left[(-v_0 + v_T) \left(-\frac{m}{bv}\right) \right]$$

$$= v_T t - \left(-\frac{m}{bv}\right) (-v_0 + v_T) \left(e^{-\frac{b v t}{m}} \right)$$

$$y(t) = v_T t - \frac{m}{bv} (-v_0 + v_T) \left(1 - e^{-\frac{b v t}{m}} \right)$$

$$v(t) = v_T - (-v_0 + v_T) e^{-\frac{b v t}{m}}$$

$$a(t) = \left(-g - \frac{b}{m} v_0\right) e^{-\frac{b v t}{m}}$$

Diaproksimasi

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$

$$e^{-\frac{b v t}{m}} = 1 - \frac{b v t}{m} + \frac{1}{2} \left(\frac{b v t}{m} \right)^2 + \dots$$

$$y(t) = V_T t - \frac{m}{bv} (-V_0 - V_T) (1 - e^{-\frac{bv}{m}t})$$

$$y(t) = V_T t - (-V_0 + V_T) \left(t - \frac{1}{2} \frac{bv}{m} t^2 \right)$$

$$y(t) = V_0 t + \frac{1}{2} \frac{bv}{m} V_0 t^2 + \frac{1}{2} \frac{bv}{m} \left(-\frac{mg}{bv} \right) t^2$$

$$b = 0$$

$$y(t) = V_0 t - \frac{1}{2} g t^2$$

$$V(t) = V_T - (-V_0 + V_T) e^{-\frac{bv}{m}t}$$

$$V(t) = V_T - (-V_0 + V_T) \left(1 - \left(-\frac{bv}{m}t \right) \right)$$

$$V(t) = V_0 + \frac{bv}{m} V_0 t - g t$$

$$b = 0$$

$$V(t) = V_0 - g t$$

$$a(t) = \left(-g - \frac{bv}{m} V_0 \right) e^{-\frac{bv}{m}t}$$

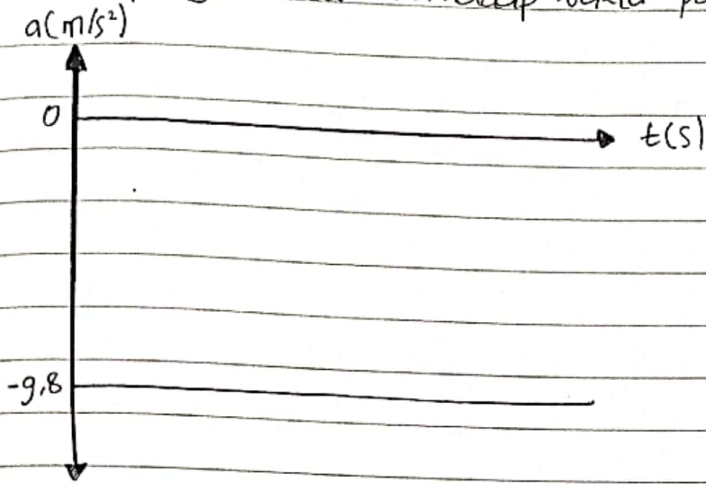
$$a(t) = \left(-g - \frac{bv}{m} V_0 \right) \left(1 - \frac{bv}{m}t \right)$$

$$a(t) = -g + g \frac{bv}{m} - \frac{bv}{m} V_0 + \frac{b^2 V_0^2}{m^2} V_0 t$$

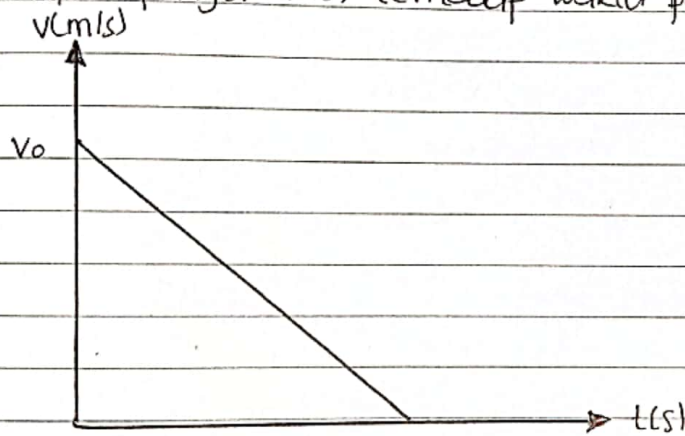
$$b = 0$$

$$V(t) = g$$

grafik fungsi $a(t)$ terhadap waktu pada gerak vertikal keatas



Grafik fungsi $v(t)$ terhadap waktu pada gerak vertikal keatas



Grafik fungsi $y(t)$ terhadap waktu pada gerak vertikal keatas

