No.

Date

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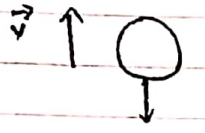
Prodi : Pendidikan Fisika (B)

Kuadrat $F = -bv^2$ dengan pengaruh gaya gerakan benda bergerak Vertikel keatas



$\Sigma F = m \cdot a$

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

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

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

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

Seperti

$$-g - \frac{bv}{m} = v$$

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

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

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

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

$$\frac{-m}{bv} \ln cv = t$$

$$\frac{-m}{bv} \ln\left(-g - \frac{bv^2}{m}\right)_{v_0}^{v_t} = t$$

$$\frac{-m}{bv}\left(\ln\left(\frac{-g \times bv^2/m}{-g \times bv^2/m}\right)\right)^{v} = t$$

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

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

$$v_t = \frac{-mg}{bv} - \left(\frac{-mg}{bv} - v_0\right) e^{-\frac{bv^2}{m}}$$

$F = -w$

$bv = mg$

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

$$v(t) = v_t - (v_t - v_0) e^{-\frac{bvt}{m}}$$

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

$$= \frac{d}{dt}\left(v_t - (-v_0 + v_T) e^{-bvt/m}\right)$$

$$= 0 - (v_0 + v_T)\left(-\frac{bv}{m}\right) \cdot e^{-bvt/m}$$

$$= -\frac{bv}{m}\left(v_0 + \frac{bv}{m} v_t\right) e^{-bvt/m}$$

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

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

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

$$y(t) = \int_0^t v_T - (-v_0 + v_T) e^{-bvt/m}$$

$$y(t) = \left[v_{t_t} - (-v_0 + v_T)\left(\frac{-m}{bv}\right) e^{-bvt/m}\right]$$

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

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

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

$$y(t) = v_T t - \frac{m}{bm}\left(-v_0 - v_T\right)\left(1 - e^{-bvt/m}\right)$$

$$v(t) = v_T - \left(-v_0 + v_t\right) e^{-bvt/m}$$

$$a(t) = \left(-g - \frac{bv}{m} v_0\right) e^{-bvt/m}$$

lalu diaproksmasi :

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

$$e^{-bvt/m} = 1 - \frac{bvt}{m} + \frac{1}{2}\left(\frac{bvt}{m}\right)^2 + \cdots$$

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

$$y(t) = v_T t - \left(-v_0 + v_T\right)\left(t - \frac{1}{2}\frac{bv}{m} t^2\right)$$

$$y'(t) = v_0 + \frac{1}{2} \times \frac{bv}{m} \cdot v_0 t^2 + \frac{1}{2} \times \frac{bv}{m}\left(-\frac{mg}{bv}\right) t^2$$

untuk $b = 0$

$$y(t) = v_0 t - \frac{1}{2} g t^2$$

$$v(t) = v_T - \left(-v_0 + v_T\right) e^{-bvt/m}$$

$$v(t) = v_T - \left(-v_0 + v_T\right)\left(1 - \left(-\frac{bvt}{m}\right)\right)$$

$$v(t) = v_0 + \frac{bv}{m} \cdot v_0 t - gt$$

untuk $b = 0$

$$a(t) = \left(-g - \frac{bv}{m} v_0\right) e^{-bvt/m}$$

$$a(t) = \left(-g - \frac{bv}{m} v_0\right)\left(1 - \frac{bvt}{m}\right)$$

$$a(t) = -g + g \frac{bvt}{m} - \frac{bv}{m} v_0 t \frac{b^2 v^2}{mt^2}$$

untuk $b = 0$

$$v_t = -g$$