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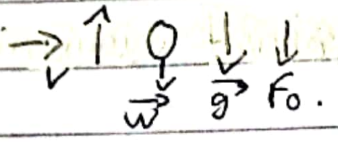

- Berdasarkan titik II Newton

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

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

$(mg + bv)\hat{y} = -m\bar{a}\hat{y}$

$(\cancel{m}g + bv) = -\cancel{m}\vec{a} \quad (\times \frac{1}{m})$

$g + \frac{bv}{m} = -a$

Subtitusi mulai a.

$g + \frac{b}{m} v = -\frac{d^2 y(t)}{dt}$

$g + \frac{b}{m} v = -\frac{dv}{dt}$

$-\frac{dv}{g+\frac{b}{m}v} = dt$

$= \int^{v(x)} \frac{dv}{g+\frac{b}{m}v} = \int_0^t dt$

misal : $g + \frac{b}{m} \cdot v = u$

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

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

Maka : $\int_0^{v(t)} \frac{1}{v} dv = \int_0^t dt$

$= \int_{v_0}^{v(t)} \frac{1}{v} \left(\frac{m}{v} du\right) = \int_0^t dt$

$-\frac{m}{b} \ln |v| = t$

$-\frac{m}{b} \ln \left| g + \frac{b}{m} v \right|_{v}^{v(t)} = t.$

$= \frac{m}{b} \left(\ln \left| g + \frac{b}{m} (v(t)) \right| - \ln \left| \frac{g + b (v)}{m} \right| \right)$

karena : $\ln a - \ln b = \ln \frac{a}{b}$.

maka :

$\ln \left| \frac{g + \frac{b}{m} (vt)}{g + \frac{b}{m} (vt)} \right| = -\frac{bt}{m}$

Contoh : $\left(\ln \left| \frac{g + \frac{b}{m} (t)}{g + \frac{b}{m} v_0} \right| \right) = e^{-\frac{bt}{m}}$

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

$g + \frac{b}{m} v_0$

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

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

$(\times -\frac{m}{b})$

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

$v(t)^2 = \left(\frac{mg}{b} + v_0\right) e^{-\frac{bt}{m}} - \frac{mg}{b}$

Date:

karena, $F = w$

$bv = mg$

$VT = \frac{mg}{b}$, maka

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

untuk $a(t)$

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

$$a(t) = (V_t + V_0)\left(-\frac{b}{m}\right) e^{-\frac{bt}{m}}$$

$$= -\frac{b}{m}(V_t + V_0) e^{-\frac{bt}{m}}$$

$$= \left(-\frac{b}{m} \cdot \frac{mg}{b} - \frac{b}{m} V_0\right) e^{-\frac{bt}{m}}$$

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

untuk : $y(t)$.

$$dy(t) = v(t) - dt$$

$$\int_0^{y(t)} dy(t) = \int_0^t v(t)\, dt$$

$$y(t) = \int_0^t \left((V_T + V_0) e^{-\frac{bt}{m}} - V_T\right)$$

$$y(t) = \left[(V_t + V_0)\left(\frac{-m}{b}\right) e^{-bt/m} - V_T \cdot T\right]_0^x$$

$$y(t) = \left[(V_t + V_0)\left(\frac{-m}{b}\right) e^{-bt/m} - V_T^{\,t}\right] - \left[(V_t + V_0)\left(\frac{-m}{b}\right)\right]$$

$$y(t) = \frac{-m}{b}(V_t + V_0)(e^{-bt/m} - 1) - V_T \cdot t$$

- Aprokmasi

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

$$y(t) = -V_T \cdot \frac{m}{b}(V_t + V_0)(1 - e^{-bt/m})$$

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$$= -v_T \cdot t + \frac{m}{b} \left(v_t + v_0\right)\left(1 - e^{-bt/m}\right)$$

$$= -v_t \cdot t + \frac{m}{b} \left(v_t + v_0\right) \left(1 - 1 + \frac{bt}{m} - \frac{1}{2}\left(\frac{bt}{m}\right)^2\right)$$

$$= v_0 t = \frac{1}{2} gt^2 - \frac{1}{2} \frac{b}{m} v_0 t^2.$$

$$y(t) = v_0 t - \frac{1}{2} gt^2 - \frac{1}{2} \cdot \frac{b}{m} v_0 t^2.$$

* untuk $b = 0$ maka.

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

$$v(t) = (v_t + v_0)\, e^{-bt/m} - v_T$$

$$= -v_T + (v_T + v_0)(1 - bt/m)$$

$$= -v_t + v_t - \frac{b}{m} v_t + \ldots + v_0 - \frac{b}{m} v_0 t$$

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

$$v(t) = v_0 - gt - \frac{b}{m} v_0 t.$$

untuk $b = 0$ maka.

$$v(t) = v_0 - gt.$$

$$a(t) = (-g - b/m\, v_0)\, e^{-bt/m}$$

$$= (-g - b/m\, v_0)(1 - bt/m)$$

$$= -g + g\frac{bt}{m} - \frac{b}{m} v_0 + \frac{b^2}{m^2} v_0 t$$

$$a(t) = -g - \frac{b}{m} v_0 + \left(\frac{b^2}{m^2} v_0 + \frac{gb}{m}\right)$$

maka $b = 0$

$$\boxed{a(t) = -g}$$