No.

Date

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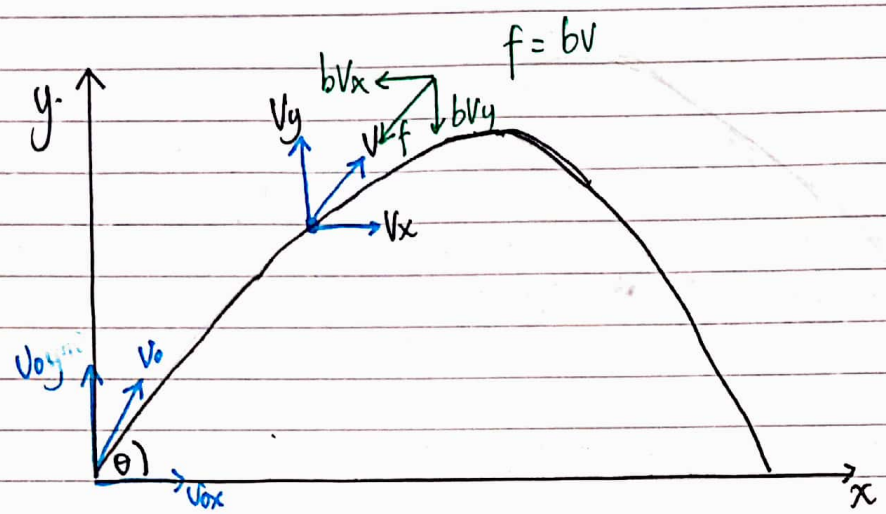
Prodi : Pendidikan. Fisika.
Tugas diskusi Mekanika Gerak Parabola dipengaruhi Hambatan Udara.



Dengan arah sumbu x.

$$a_x = -bV_x$$

$$\frac{dV_x}{dt} = -bV_x$$

$$\int_0^t \frac{dt}{dV_x} = \int_{V_o\cos\theta}^{V_x} \frac{1}{-bV_x}$$

$$t\Big]_0^t = \frac{-1}{b}\left(\ln V_x\right)\Big]_{V_o\cos\theta}^{V_x}$$

$$t = -\frac{1}{b}\left(\ln V_x - \ln V_o\cos\theta\right) \quad \text{sifat } \ln a - \ln b = \ln\frac{a}{b}$$

$$-bt = \ln\left(\frac{V_x}{V_o\cos\theta}\right)$$

$$e^{-bt} = e^{\ln\left(\frac{V_x}{V_o\cos\theta}\right)}$$

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$$e^{-bt} = \left(\frac{V_x}{V_0 \cos\theta}\right).$$

$$\boxed{V_x = V_0 \cos\theta \cdot e^{-bt}.}$$ ↝ V_x dengam hambatan Udara.

↝ Aproksimasi e^{-bt} pdc $V_x = V_0 \cos\theta \cdot e^{-bt}$.

$$e^{-bt} = 1 - bt + \frac{1}{2}(bt)^2.$$

$$V_x = V_0 \cos\theta \left(1 - bt + \frac{1}{2} b^2t^2\right).$$

$$\boxed{V_x = V_0 \cos\theta - V_0 . bt \cos\theta + \frac{1}{2} V_0 b^2t^2 \cos\theta}$$ Persamaan V_x dg dir Resistance

jika $b=0$ maka $V_x = V_0 \cos\theta$.

Mencari persamaan x

$$V_x = V_0 \cos\theta \cdot e^{-bt}.$$

$$\int_0^x V_x = \int_0^t V_0 . \cos\theta \cdot e^{-bt}$$

$$x = V_0 \cos\theta \cdot \left(-\frac{1}{b} e^{-bt}\right)\Big]_0^t.$$

$$= V_0 . \cos\theta \left(-\frac{1}{b} e^{-bt} - \left(-\frac{1}{b}\right)\right).$$

$$= V_0 . \cos\theta \left(-\frac{1}{b} e^{-bt} + \frac{1}{b}\right).$$

$$\boxed{x(t) = \frac{V_0 . \cos\theta}{b} \left(1 - e^{-bt}\right).}$$

↝ Aproksimasi $e^{-bt} = 1 - bt + \frac{1}{2}b^2t^2$ pada $x(t) = \frac{V_0 \cos\theta}{b}(1 - e^{-bt})$.

$$x(t) = \frac{V_0 \cdot \cos\theta}{b} \cdot (1 - e^{-bt})$$

$$= \frac{V_0 \cdot \cos\theta}{b} \left(1 - \left(1 - bt + \frac{1}{2} b^2t^2\right)\right).$$

$$= \frac{V_0 \cdot \cos\theta}{b} \left(bt - \frac{1}{2} b^2t^2\right)$$

$$= \frac{V_0 \cos\theta \cdot bt}{b} - \frac{1}{2}\frac{b^2t^2 V_0 \cos\theta}{b}$$

$$\boxed{x(t) = V_0 t \cos\theta - \frac{1}{2} bt^2 V_0 \cos\theta}$$ ⇝ Persamaan $x(t)$ dengan pengaruh Hambatan Udara.

Jika $b = 0$ maka $x(t) = V_0 . t \cos\theta$.

Dengan arah sumbu y.

$$a_y = -g - bV_y$$

$$\frac{dV_y}{dt} = -g - bV_y$$

$$\int_0^t \frac{dV_y}{dt} = \int_{V_0 \sin\theta}^{V_y} (-g - bV_y)$$

$$\int_0^t \frac{dt}{dV_y} = \int_{V_0 \sin\theta}^{V_y} \frac{-1}{(g + bV_y)} \quad \left| \times -\frac{1}{b} \right.$$

$$t\Big]_0^t = -\frac{1}{b} \left(\ln (g + bV_y) \right) \Big]_{V_0 \sin\theta}^{V_y}$$

$$t = -\frac{1}{b} \left(\ln (g + bV_y) - \ln (g + b V_0 \sin\theta) \right) \quad \left| \times -b \right.$$

$$-bt = \ln \left| \frac{g + bV_y}{g + b . V_0 \sin\theta} \right|$$

$$e^{-bt} = \left| \frac{g + bV_y}{g + bV_0 \sin\theta} \right|$$

$$g + bV_y = (g + b . V_0 \sin\theta) . e^{-bt}$$

$$\boxed{V_y = \frac{(g + b . V_0 \sin\theta) . e^{-bt} - g}{b}}$$

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~ Aproksimasi $e^{-bt} = 1 - bt$ pada $V_y = \frac{1}{b}\left[(g + b.V_0 \sin\theta)e^{-bt} - g)\right]$.

$$V_y = \frac{1}{b}\left[(g + b\,V_0 \sin\theta)\,e^{-bt} - g\right]$$

$$= \frac{1}{b}\left[g e^{-bt} + b.V_0 \sin\theta \cdot e^{-bt} - g\right].$$

$$= \frac{g e^{-bt}}{b} + \frac{b.V_0 \sin\theta \cdot e^{-bt}}{b} - \frac{g.}{b}.$$

$$= \frac{g(1-bt).}{b} + V_0 \sin\theta\,(1-bt) - \frac{g.}{b}.$$

$$= \frac{g - gbt}{b} + V_0 \sin\theta - V_0\, bt \sin\theta \cdot - gb.$$

$$= V_0 \sin\theta - gt - V_0\, bt \sin\theta.$$

Jika $b = 0$ maka $\boxed{V_y = V_0 \sin\theta - gt}$

Mencari Persamaan y.

$$V_y = V_0 \sin\theta - gt - V_0\, bt \sin\theta.$$

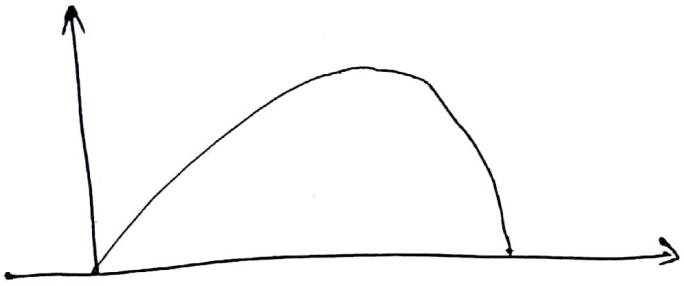
$$\int \frac{dy}{dt} = \int (V_0 \sin\theta - gt - V_0\, bt \sin\theta)$$

$$y = V_0 t \cdot \sin\theta - \frac{1}{2} g t^2 - \frac{1}{2} V_0\, b t^2 \sin\theta.$$

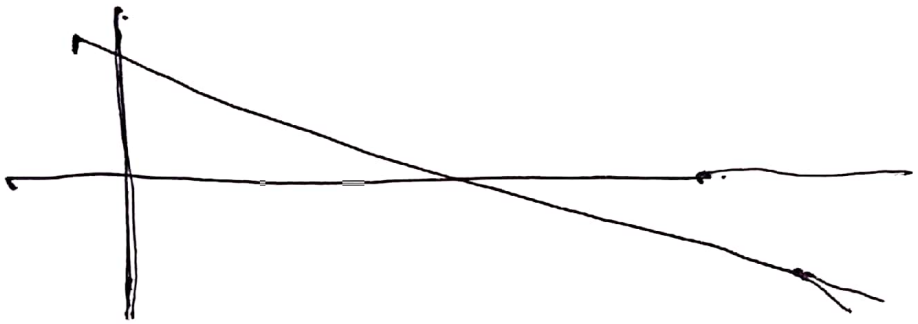
Jika $b = 0$ maka $\boxed{y = V_0\, t \cdot \sin\theta - \frac{1}{2} g t^2.}$

Grafik Gerak Parabola dg Hambatan Udara.

1). Grafik. y terhadap t



2). Grafik. Kecepatan terhadap t



3). Grafik a terhadap t.