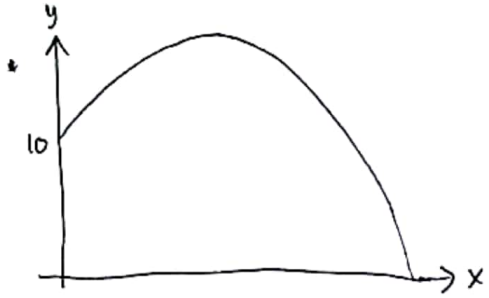
UTS FISIKA 1A 2006 — Reynaldi Saputra

1) a. $\vec{r}(t) = (100 \cdot \frac{4}{5}t)\uparrow + (10 + 100 \cdot \frac{3}{5}t - \frac{1}{2} \cdot 9{,}8t^2)\uparrow$

$= (80t)\uparrow + (10 + 60t - 4{,}9t^2)\uparrow$



$\vec{r}(1) = (80)\uparrow + (65{,}1)\uparrow$

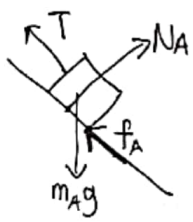
b. 65,1 m dari atas tanah

c. $0 = 10 + 60t - 4{,}9t^2$

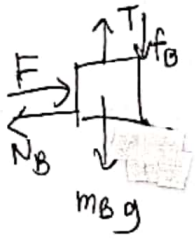
$t = \frac{-60 \pm \sqrt{60^2 - 4 \cdot 10 \cdot 4{,}9}}{2(-4{,}9)} = \frac{-60 \pm \sqrt{3600 - 196}}{-9{,}8} = \frac{-60 \pm \sqrt{3404}}{-9{,}8}$

$t \approx 12{,}08$ s

2) a) Balok A



Balok B



b) $m_A g \sin\theta - T - f_A = 0$

$(5)(9{,}8)\frac{3}{5} - T - \mu_s \cdot m_A g \cos\theta = 0$

$T = 29{,}4 - 0{,}25 \cdot 5 \cdot 9{,}8 \cdot \frac{4}{5}$

$T = 29{,}4 - 9{,}8$

$T = 19{,}6$ N

$T = m_B g + f_B$

$19{,}6 = 1 \cdot 9{,}8 + \mu_s N_B$

$19{,}6 = 9{,}8 + 0{,}25 \cdot F$

$0{,}25F = 9{,}8$

$F_{min} = 39{,}2$ N

Gaya normal sama dengan F hanya arahnya ke kiri

c) $\Sigma F = m_{\text{sistem}} \cdot a$

$m_A g \sin\theta - \mu_k \cdot m_A g \cos\theta - m_B g = (m_A + m_B) a$

$29,4 - (0,2)\cdot(39,2) - 9,8 = 6a$

$29,4 - 7,84 - 9,8 = 6a$

$11,76 = 6a$

$a = 1,96\ m/s^2$

3) a. $W_{ABC} = W_{AB} + W_{BC}$

$= \int_0^8 2\,dy + \int_{-2}^{6} 8\,dx$

$= 16 + 64$

$= 80$

$W_{ADC} = W_{AD} + W_{DC}$

$= \int_{-2}^{6} 0\,dx + \int_0^8 -6\,dy$

$= -48$

b. Tidak konservatif, sebab dua lintasan berbeda menghasilkan besar usaha yang ~~sama~~ berbeda

c. $W = \Delta K$

$\int_0^4 2\,dy = \frac{1}{2} m v^2$

$8 = \frac{1}{2} \cdot 1 \cdot v^2$

$v^2 = 16$

$v = 4\ m/s$

4) a. $\Sigma F = ma$

$F_{pegas} = m x''$

$-kx = m x''$

$0 = mx'' + kx$

$0 = 0,1\, x'' + 10x \quad , x(0) = 0,1$ meter

b. Misal $x(t) = A \sin(\omega t + \phi) \Rightarrow \omega = \sqrt{\frac{k}{m}} = \sqrt{\frac{10}{0,1}} = 10$ rad/s , $A = 0,1$ meter

$x(t) = 0,1 \sin(10t + \phi) \Rightarrow x(0) = 0,1 \Rightarrow \sin(\phi) = 1 \Rightarrow \phi = \frac{\pi}{2}$

$\therefore x(t) = 0,1 \sin(10t + \frac{\pi}{2})$

c. $v(t) = \cos\left(10t + \frac{\pi}{2}\right)$

$\Rightarrow x(t) = 0{,}04$

$0{,}1 \sin\left(10t + \frac{\pi}{2}\right) = 0{,}04$

$\sin\left(10t + \frac{\pi}{2}\right) = 0{,}4$

$\cos\left(10t + \frac{\pi}{2}\right) = \pm \frac{\sqrt{21}}{5}$

$\Rightarrow v = \pm \frac{\sqrt{21}}{5}$

$EK = \frac{1}{2} m v^2 = \frac{1}{2} \cdot 0{,}1 \cdot \frac{21}{25} = \frac{21}{500} = 0{,}042$ Joule

5) a. $I = mv_{akhir} - mv_{awal}$

$= 0{,}25\,(10\hat{i} - 20\hat{j} + 20\hat{k} - 30\hat{j})$

$= 0{,}25\,(10\hat{i} - 50\hat{j} + 20\hat{k})$

$= 2{,}5\hat{i} - 12{,}5\hat{j} + 5\hat{k}$

b. $F = \frac{I}{\Delta t} = \frac{1}{0{,}01}(2{,}5\hat{i} - 12{,}5\hat{j} + 5\hat{k}) = 100(2{,}5\hat{i} - 12{,}5\hat{j} + 5\hat{k})$

$= 250\hat{i} - 1250\hat{j} + 500\hat{k}$

$|F| = \sqrt{250^2 + 1250^2 + 500^2} = 250\sqrt{1 + 5^2 + 2^2} = 250\sqrt{30}$