No.

Date :

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Kelas : B

2.1 a). $Fx = m\ddot{x} = F_0 + ct$

$m \frac{dv}{dt} = F_0 + ct$

$m\,dv = (F_0 + ct)\,dt$

$m(v - v_0) = F_0(t - t_0) + \frac{c}{2}(t^2 - t_0^2)$

$v_0 = 0$ at $t_0 = 0$

$mv = F_0 t + \frac{ct^2}{2}$

$v(t) = \frac{1}{m}\left(F_0 t + \frac{ct^2}{2}\right) = \frac{dx}{dt}$

$\int_{x_0}^{x} dx = \int_{t_0}^{t} \frac{1}{m}\left(F_0 t + \frac{ct^2}{2}\right) dt$

$x - x_0 = \frac{1}{m}\left(\frac{F_0}{2}(t^2 - t_0^2) + \frac{c}{6}(t^3 - t_0^3)\right)$

$x = \frac{1}{m}\left[F_0/2\, t^2 + ct^3/6\right]$

b). $Fx = m\frac{dv}{dt} = F_0 \sin ct$

$\int_0^v dv = \frac{F_0}{m}\int_0^t \sin ct\, dt$

$v(t) = -\frac{F_0}{mc}\cos ct$

$x(t) = \int_0^x dx = -\frac{F_0}{mc}\int_0^t \cos ct\, dt$

$= -\frac{F_0}{mc^2}\sin ct$

c). $Fx = m\frac{dv}{dt} = F_0 e^{ct}$

$v(t) = F_0/m \int_0^t e^{ct}\, dt$

$= F_0/cm\; e^{ct}$

$x(t) = F_0/c^2 m\; e^{ct}$

2.2 a). $F_x = -\frac{dV}{dx} = F_0 + cx$

$F_x = mv \frac{dv}{dx} = F_0 + cx$

$\int_{v_0}^{v} m v\, dv = \int_0^x (F_0 + cx)\, dx$

$m/2\, v^2 = F_0 x + c/2\, x^2$

$v = \sqrt{2/m\,(F_0 x + c/2\, x^2}$

b). $F(x) = mv\, dv/dx = F_0 e^{-cx}$

$1/2\, mv^2 = -F_0/c\; e^{-cx}$

$v = 2/m\,[-F_0/c\; e^{-cx}]^{1/2}$

c). $F(x) = mv\, dv/dx = F_0 \cos cx$

$1/2\, mv^2 = \int_0^x F_0 \cos cx = F_0/c\, \sin cx$

$v = 2/m\,[F_0/c\, \sin cx]^{1/2}$

2.3 a). $F_x = -dV/dx = F_0 + cv$

$V(x) = -[F_0 x + c/2\, x^2] + c$

b). $F_x = -dV/dx = F_0 e^{-cx}$

$\int_{V(x_0)}^{V(x)} dV = -F_0 \int_{x_0}^{x} e^{-cx}\, dV$

No.

Date :

$U(x) - U(x_0) = F_0/c\,[e^{cU} - e^{-cx_0}]$

c). $F_x = -\frac{dU}{dx} = F_0 \cos cx$

$\int_{U(x_0)}^{U(x)} dU = -F_0 \int_{x_0}^{x} \cos(cx)\, dU$

$U(x) - U(x_0) = -F_0/c\,[\sin cx - \sin cx_0]$

2.9 a) $U(x) = -\int F(x)\, dx$

$= -\int (-kx)\, dx$

$= kx^2/2$

b). $E = T_0 = 1/2\, kA^2$

$E = T(x) + U(x)$

$T(x) = E - U(x)$

$T(x) = 1/2\, kA^2 - 1/2\, kx^2$

$T(x) = k/2\, (A^2 - x^2)$

c). Pada awal, hanya memiliki energi kinetik (E_k) maka hal itu adalah energi total $E = T_0 = 1/2\, kA^2$

d). Titik balik dapat kita temukan dari $E = U(x)$

$E = U(x)$

$1/2\, kA^2 = 1/2\, kx^2$

$x = \pm A$

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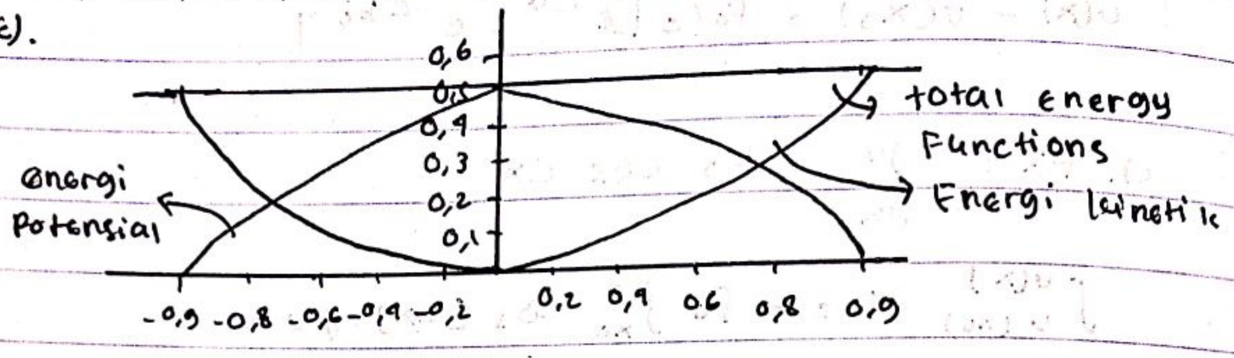
Date :

e).



2.8 Given $v = b/x^3$

$F = m\, dv/dt$

$= m\, dv/dx \cdot dx/dt$

$= mv\, dv/dx$

$dv/dx = -3b/x^4$

$F = m\,(b/x^3)(-3b/x^4)$

$= -3mb^2/x^7$

2.11 $F(v) = -cv^{3/2}$

$= m\, dv/dt = m\, dv/dt \cdot dx/dt = m \cdot v\, dv/dx$

Jarak yang ditempuh

$-cv^{3/2} = m \cdot v\, dv/dx$

$\int_0^x dx = \int_{v_0}^{v} mv / cv^{3/2}\, dv$

$x = -m/c \int_{v_0}^{v} v^{-1/2}\, dv$

$= -m/c \cdot \frac{v^{1/2}}{1/2} \Big|_{v_0}^{v}$

$= 2m/c\,(\sqrt{v_0} - \sqrt{v})$

Maka jarak maksimal yang ditempuh adalah $x_{max} = 2m\sqrt{v_0}/c$

No.

Date :

2.12 Upwark Motion

Hukum 2 Newton

$Ma_x = \Sigma F_x$

$Ma_x = -mg - C_2 v^2$

$a_x = dv/dt = dv/dx \cdot dx/dx$

$mv\, dv/dx = -mg - C_2 v^2$

$v\, dv/dx = -g \cdot C^2/m\, v^2$

$k = C^2/m$

$v\, dv/dx = -g \cdot kv^2$

$\int_{v_0}^{v} v\,dv/-g-kv^2 = \int_0^x dx$

$y = -g - kv^2$

$dy = -2kv\, d\cancel{y}$

$v\,dv = -1/2k\, dy$

$\int_{v_0}^{v} -1/2k\; dy/y = \int_0^x dv$

$-1/2k \ln\left(\frac{-g-kv^2}{-g-kv_0^2}\right) = x$

$\frac{-g-kv^2}{-g-kv^2} = e^{-2k\cancel{x}}$

$-g-kv^2 = (-g-kv_0^2)e^{-2}$

$kv^2 = (g+kv_0^2)e^{-2k\cancel{x}}$

$v^2 = (\frac{g}{k} + \cancel{k}v_0^{\cancel{2}})e^{-2kx}$

$A = g/k + v_0^2$

$v^2 = Ae^{-2kx} - g/k$

downwark motion

$Ma_x = \Sigma F_x$

$Ma_x = -mg + C_2 v^2$

$a_x = dv/dt = dv/dx \cdot dx/dt = dv/dx\, v$

$mv \cdot dv/dx = -mg + C_2 v^2$

$v\,dv/dx = -g + C^2/m\, v^2$

$k = C^2/m$

$v\,dv/dx = -g + kv^2$

$\int_0^v v\,dv/-g+kv^2 = \int_{x_0}^x dx$

$y = -g + kv^2$

$dy = 2k\,v\,dv$

$v\,dv = 1/2k\; dy$

$\int_0^v 1/2k\; dy/y = \int_{x_0}^x dx$

$1/2k \ln(y)\Big|_0^v = x\Big|_{x_0}^x$

$1/2k \ln\left(\frac{-g+kv^2}{-g}\right) = x - x_0$

$\frac{-g+kv^2}{-g} = e^{2k(x-x_0)}$

$-g+kv^2 = -ge^{2k(x-x_0)}$

$kv^2 = -ge^{2k(x-x_0)} + g$

$v^2 = -g/k\; e^{-2kx_0} e^{2kx} +$

$B = g/k\; e^{-2kx_0}$

$v^2 - g/k\; Be^{2kv}$

2.13 $v^2 = (g/k + v_0^2)\, e^{-2kx} - g/k$

$v^2 = -g/k\, e^{-2kx_0} e^{2kx} + g/k$

$0 = (g/k + v_0^2)\, e^{-2kh} - g/k$

$$e^{-2kh} = \frac{g/k}{g/k + v_0^2}$$

$v^2 = -g/k\, e^{-2kh} e^{2k \cdot 0} + g/k$

$$= -g/k \cdot \frac{g/k}{g/k + v_0^2} \cdot 1 + g/k$$

$v_t^2 = g/k$

$v^2 = -v_t^2 \cdot v_t^2 / v_t^2 + v_0^2 + v_t^2$

$$= v_t^2 \cdot \left(\frac{v_t^2 + v_0^2 - v_t^2}{v_t^2 + v_0^2}\right) = \frac{v_t^2\, v_0^2}{v_t^2 + v_0^2}$$

$v = v_t^2 \cdot v_0^2 / \sqrt{v_t^2 + v_0^2}$

2.14 $F(x) = -kx^{-2}$

$m\, dx/dt = -kx^{-2}$

$dx/dt = dx/dt \cdot dx/dx$

$= x\, dx/dx$

$mx\, dx/dx = -kx^{-2}$

$\int_0^x x\,dx = -k/m \int_b^x dx/x^2$

$1/2\, x^3 = k/m\, (1/x - 1/b)$

$\dot{x} = \sqrt{2k/mb\, (b-x)/x)}$

$dx/dt = \sqrt{2k/mb\, (b-x)/\dot{x})}$

$dt = \sqrt{mb/2k\, (x/bx)}\, dx$

$\int_0^t dt = \sqrt{m \cdot b/2k}\, (b \int_b^0 (x/b-x)^{1/2}\, dx)$

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Date :

$t = \sqrt{mb/2k}\ (b \int_b^0 Ax / b - x - \int_b^0 dx)$

$\int_0^t dt = \sqrt{mb^3/2k} \int_b^0 (x/b / 1 - x/b)^{1/2}\, d(x/b)$

$$t = \sqrt{mb^3/2k} \int_{-\pi/2}^{0} \sin\theta \frac{(2 \sin\theta \cos\theta)}{\cos\theta}\, d\theta$$

$t = \sqrt{2mb^3/k} \int_{-\pi/2}^{0} \sin^2\theta\, d\theta$

$t = \pi\sqrt{mb^3/8k}$

2.15 Hukum 2 Newton

$ma = \Sigma F$

$ma = mg - c_1 v - c_2 v^2$

$ma = 0$

$mg - c_1 v - c_2 v^2 = 0$

$c_2 v^2 + c_1 v - mg = 0$

$$v_{12} = \frac{-c_1 \pm \sqrt{c^2 + 4c_2 mg}}{2c_2}$$

$$v_1 = \frac{-c_1 + \sqrt{c_1^2 + 4c_2 mg}}{2c_2}$$

$v_1 = v_t = -c_1/2c_2 + \sqrt{(c_1/2c_2)^2 + mg/c_2}$

$v_t = -c_1/2c_2 + \sqrt{(c_1/2c_2)^2 + mg/c_2}$