(1) CH8:
LET 10^7 BE understood Test

(A) $(1)(2.6)+(12.0)(0.100)$

$= (1)v_{1f} + (12)v_{2f}$

(B) and $2.6-(0.100)$

$= v_{2f} - v_{1f}$

substitute:

$v_{2f} = 2.5 + v_{1f}$

$3.8 = (1)v_{1f} + (12)v_{2f}$

$3.8 = (1)v_{1f} + (12)(2.5 + v_{1f})$

$3.8 = 13.0v_{1f} + 30$

$v_{1f} = -2.015385...$

$v_{2f} = 2.5 + (-2.015385...)$

$= 0.48 \frac{m}{s}$

SUMMARY $v_{1f} = -2.02 \times 10^7 \frac{m}{s}$

$v_{2f} = 4.8 \times 10^6 \frac{m}{s}$

3 solutions

(C) Before: $v_{1i} - v_{2i} = 2.5$

after: $v_{2f} - v_{1f} = 0.48-(-2.02)$

$= 2.5$

$v_{rel} = 2.5 \times 10^7 \frac{m}{s}$ before, after

(2) ch8:

(a) $mv_0 = MV' + mv$

$(0.025)(400) = (325)(0.020) + (0.025)v$

$v = \frac{10 - 6.5}{0.025} = 140 \frac{m}{s}$

(b) $(0.025)(140) = (312 + 0.025)\bar{v}_f$

$\bar{v}_f = \frac{3.5}{312.025}$

$\bar{v}_f = \boxed{0.0112} \frac{m}{s}$

(c) $\Delta KE = \frac{1}{2}mv_0^2 - \frac{1}{2}MV^2 - \frac{1}{2}(m+M)\bar{v}_f^2$

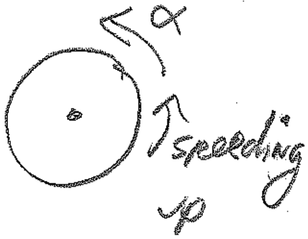
$= \frac{1}{2}(0.025)(400)^2 - \frac{1}{2}(325)(0.020)^2$

$- \frac{1}{2}(312.025)(0.0112)^2$

$= \boxed{2000\,J}$

3) Ch 9

a) $\alpha > 0$



b)

$$\Delta\theta = \left(\frac{\omega_0 + \omega_7}{2}\right)(7)$$

$$\Delta\theta = \left(\frac{-6+8}{2}\right)(7)$$

$\Delta\theta = 7$ RADIANS

EACH ROTATION $= 2\pi$ RADIANS $= 6.28$ RAD

THE 7 RAD IS A LITTLE OVER ONE RADIAN.

c) $0 = -6 + \alpha\Delta t$

NOTE: $\alpha = \dfrac{\omega_7 - \omega_0}{7-0}$

$$= \frac{8-(-6)}{7} = 2\,\frac{\text{RAD}}{s^2}$$

THUS: $\Delta t = \dfrac{6}{\alpha} = 3$ sec.

d) SLOWS DOWN 0 TO 3 sec

SPEEDS UP 3 TO 7 sec

4) CH 9

NOTE:
$KE_i + U_i = KE_f + U_f$
is the SAME AS:

$\Delta KE + \Delta U = 0$

NOTE: $\Delta KE > 0$ so $\Delta U < 0$.

$$\Delta KE = \tfrac{1}{2}(1)v^2 + \tfrac{1}{2}(1.5)v^2 + \tfrac{1}{2}I\omega^2$$

where $\omega = \dfrac{v}{R}$ and

$$I = \tfrac{1}{2}(2)(0.250)^2 = \tfrac{1}{2}MR^2$$

$$\Delta KE = \tfrac{1}{2}(1)v^2 + \tfrac{1}{2}(1.5)v^2 + \tfrac{1}{2}\tfrac{1}{2}MR^2\frac{v^2}{R^2}$$

where $M = 2.000$ kg.

$$\Delta KE = \tfrac{1}{2}(1)v^2 + \tfrac{1}{2}(1.5)v^2 + \tfrac{1}{4}(2)v^2$$

$$\Delta KE = \boxed{\tfrac{7}{4}v^2} > 0$$

$$\Delta U_B = (1.5)gh\sin\theta - (1)gh$$

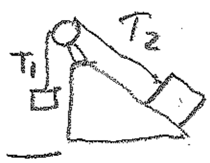
$$= (1.5)gh\cdot\tfrac{1}{2} - (1)gh$$

$$= \boxed{-0.25gh} < 0$$

THUS: $\tfrac{7}{4}v^2 - 0.25gh$

$$v = \sqrt{\tfrac{1}{7}gh} = \sqrt{\frac{(9.8)(1)}{(7)}}$$

$v = 1.18\ \frac{m}{s}$



b) $v^2 = 2ah$

$$\Rightarrow a = \frac{v^2}{2h} = 0.70\ m/s^2$$

NOTE: $(1)a = (1)g - T_1$

THUS: $T_1 = g - 0.7 = 9.1$ (N) $> T_2$

T_1 = Tension in string section above block.

$T_1 > T_2$

4(b) continued

NOTE: $T_1 > T_2$

NOTE:

$(1.5)a = T_2 - (1.5)g\sin 30^\circ$

$T_2 = (1.5)(0.7) + (1.5)(9.8)\frac{1}{2}$

$T_2 = 8.4\,(N) < T_1$

SO YOU DO NOT NEED CH 10 FOR TENSIONS.

5. CH 14

(a) $\frac{1}{2}mv_0^2 + \frac{1}{2}kx_0^2 = \frac{1}{2}kA^2$

$\frac{1}{2}(2.1)(3.5)^2 + \frac{1}{2}(110)(0.14)^2 = \frac{1}{2}(110)A^2$

$A = 0.503\,(m)$

(b) speed = MAXIMUM at $x = 0$:

$\frac{1}{2}mv_{MAX}^2 = \frac{1}{2}kA^2$

$v_{MAX} = A\sqrt{\frac{k}{m}}$

$= (0.503)\sqrt{\frac{110}{2.1}} = 3.64\,\frac{m}{s}$

(c) $a_{MAX} = \frac{\text{FORCE}}{\text{MASS}} = \frac{kA}{m}$

$a_{MAX} = \left(\frac{110}{2.1}\right)(0.503)$

$= 26.3\ m/s^2$

$\boxed{X = -A}$

(d) $\frac{1}{2}kA^2 = \frac{1}{2}(110)(0.503)^2$

$= 13.9\,(J)$

(e) $x_0 = A\cos\phi > 0$

$v_0 = -\omega A\sin\phi > 0$

THUS $\sin\phi < 0$

THUS: ϕ IN QUADRANT IV

$\phi = -\cos^{-1}\left(\frac{x_0}{A}\right)$

$= -\cos^{-1}\left(\frac{0.140}{0.503}\right) = -73.8^\circ$

$x = (0.503)\cos(\omega t - 73.8^\circ)$

convert TO RADIANS

(f) $\frac{1}{2}mv^2 + \frac{1}{2}k\left(\frac{A}{2}\right)^2 = \frac{1}{2}kA^2$

$\frac{1}{2}(2.1)v^2 = \frac{1}{2}\left(\frac{3}{4}kA^2\right)$

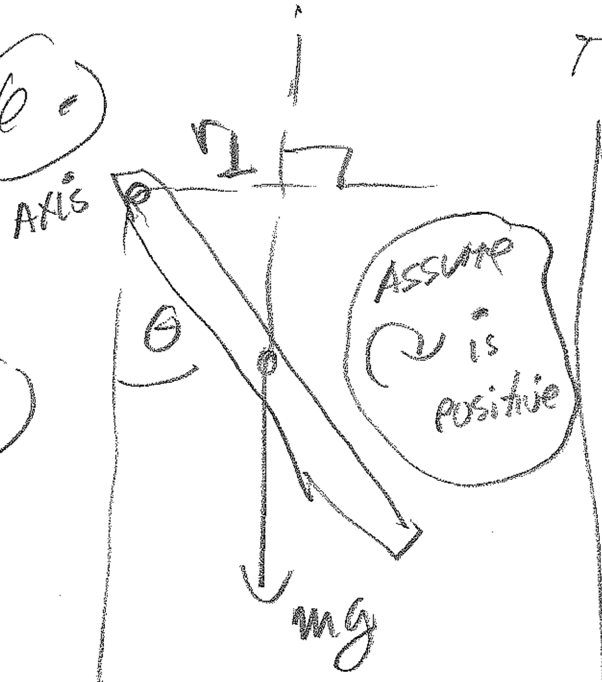
$2.1v^2 = \frac{3}{8}(110)(0.503)^2$

$v = 3.15\,\frac{m}{s}$

(g) $T = 2\pi\sqrt{\frac{m}{k}} = 0.87\,(s)$

Test 3 Solutions

6.



(a)

$\tau = r_\perp \cdot mg$

$= \frac{L}{2} \sin\theta \cdot mg$

$\tau = \frac{(1.00\,m)}{2} \cdot \sin 20^\circ \cdot 154\,(N)$

$\tau = \boxed{26.3\ N\text{-}m}$

(b) $|\alpha| = \frac{\tau}{I}, \quad I = \frac{ML^2}{3}$

$|\alpha| = \frac{\frac{L}{2} \sin 20^\circ \cdot mg}{ML^2/3}$

$= \frac{3g \sin 20^\circ}{2L}$

$= \frac{3(9.8)\sin 20^\circ}{(2)(1.00)}$

$= \boxed{5.03\ \frac{RAD}{s^2}}$