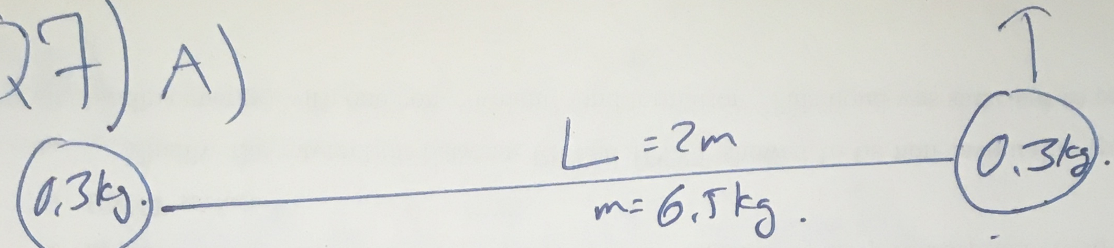
Q7) A)



$$I = \frac{1}{12} mL^2 + 0.3\left(\frac{L}{2}\right)^2 + 0.3\left(\frac{L}{2}\right)^2$$

$$= \frac{1}{12} 6.5kg(4m^2) + \frac{2L^2}{4} 0.3kg.$$

$$= \frac{1}{12} 6.5kg\,(4m^2) + 4m^2\, 0.15kg.$$

$$= 2.1\bar{6} + 0.6$$

$$= 2.7\bar{6} = 2.77$$

B) $\frac{1}{3} 6.5kg(4m^2) + 0.3kg.(4m^2)$

$8.\bar{6} + 0.3.4. = 9.87$

$\cancel{8.9} = \cancel{9.00}$

$\cancel{8.97}$

Or $I_{com} + \frac{1}{2}(0.6+6.5)kg.\left(\frac{L}{2}\right)^2$

$+ 7.1 kg\, m^2$

Q8)

$$\frac{1}{2}mv^2 + \frac{1}{2}I\omega^2 = mgh$$

I: hoop : mr^2 → Largest

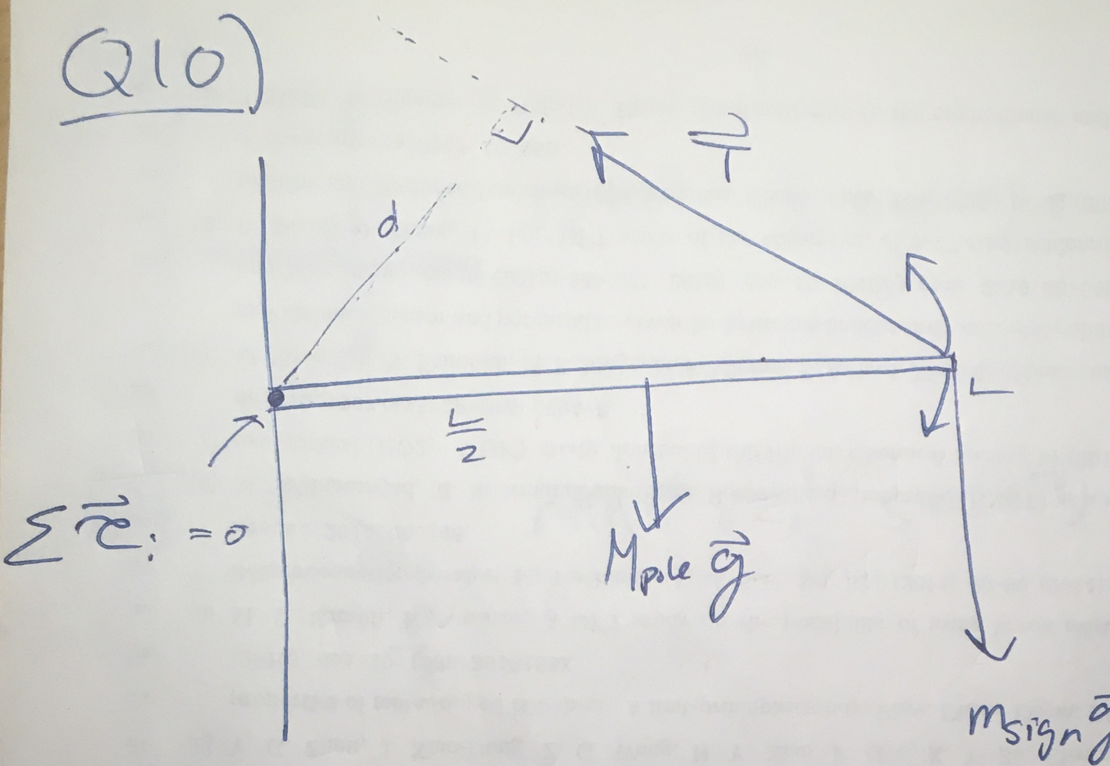
solid sphere : $\frac{2}{5}mr^2$ → 4th.

hollow sphere : $\frac{2}{3}mr^2$ → 2nd.

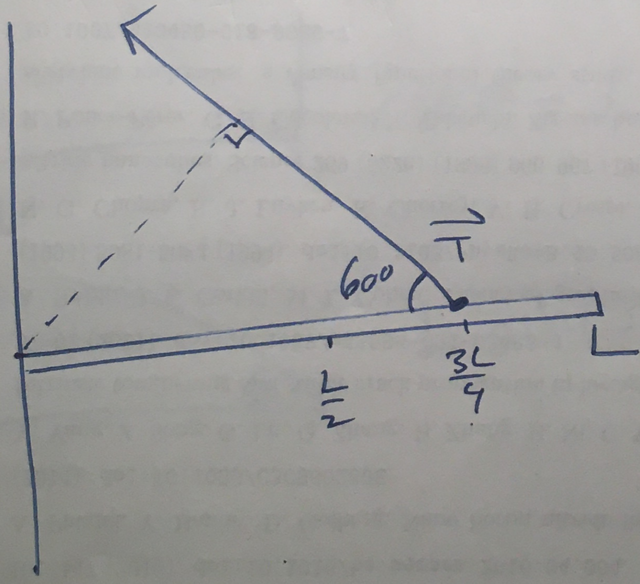
solid cylinder : $\frac{1}{2}mr^2$ → 3rd

$$\frac{1}{2}\cancel{m}v^2 + \frac{1}{2}A\cancel{m}r^2\omega^2 = \cancel{m}gh.$$

Q10)



A)



$$r\sin\theta = \frac{3L}{4}\sin(60^\circ)$$

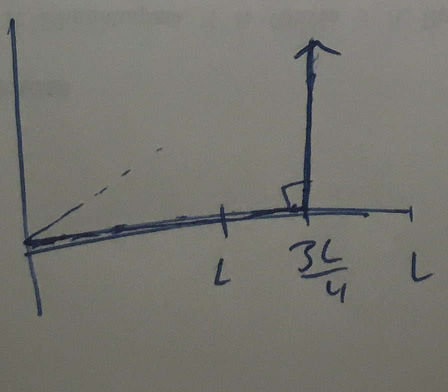
$$= \frac{3L}{4}\frac{\sqrt{3}}{2} = \frac{3\sqrt{3}}{8}$$

$$= 0.65\,L$$

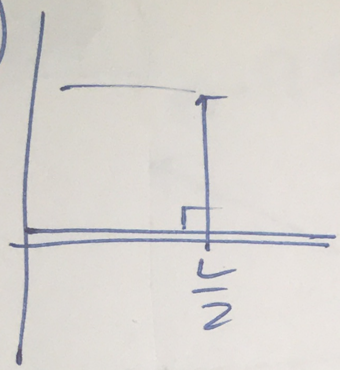
$$r\sin\theta : \frac{3L}{4}\sin(90^\circ) = \frac{3L}{4}$$

$$= 0.75L$$

B).

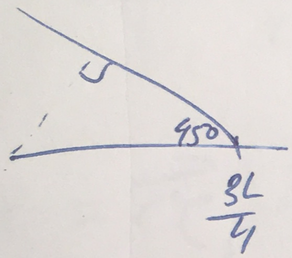


C)



$$r\sin\theta = \frac{L}{2}\sin(90°) = \frac{L}{2} = 0.5L$$

D)

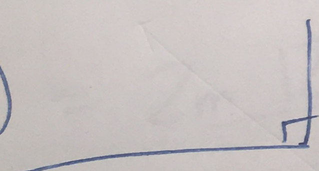


$$r\sin\theta = \frac{3L}{4}\sin(45°) = \frac{3L}{4}\,\cancel{\frac{\sqrt{2}}{\sqrt{2}\sqrt{2}}}\,\cancel{\frac{\sqrt{2}}{\sqrt{2}}}$$

$$= \frac{3L}{\sqrt{2}\,4}$$

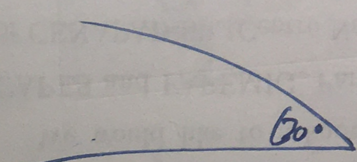
$$= 0.53L$$

E)



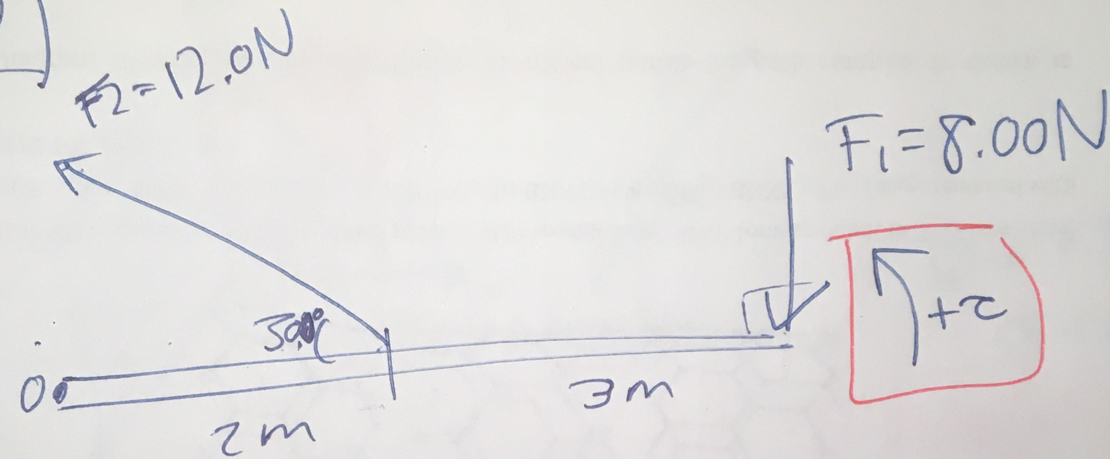
$$r\sin\theta = L\sin(90°) = L$$

F)



$$L\sin(30°) = \frac{L}{2}$$

Q11



$$\vec{\tau}_{Net} = \vec{\tau}_1 + \vec{\tau}_2$$

$$= r_1 F_1 \sin\theta_1 + r_2 F_2 \sin\theta_2$$

$$= 2m\ 12.0N \sin 30° - 5m\ 8.00N \sin(90)$$

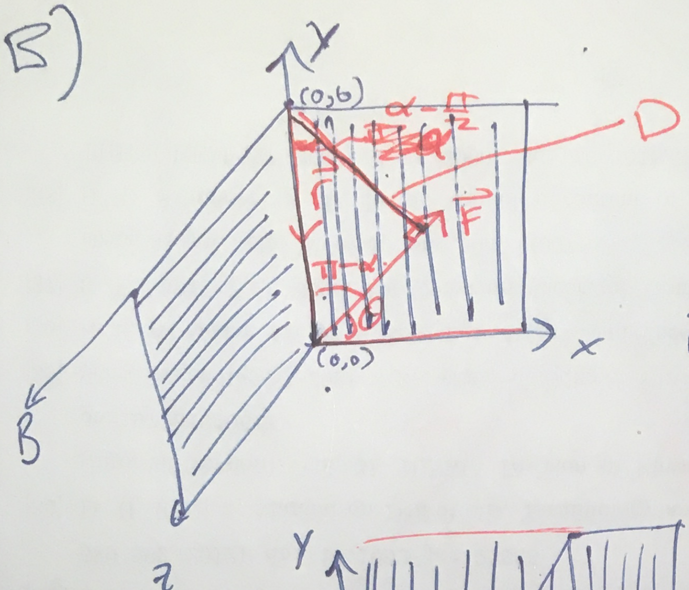
$$= \frac{24}{2} - 40.$$

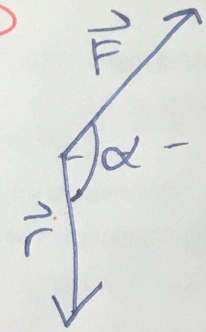
$$= 12 - 40$$

$$= \cancel{12.0Nm}.$$

$$-28.0 N\cdot m.$$

12) B)





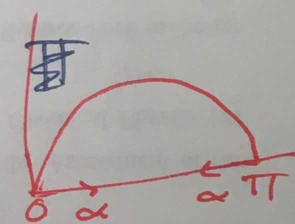
$$\left(\pi - \alpha + \frac{\pi}{2}\right) + \theta = \pi$$

$$\theta = \alpha - \frac{\pi}{2}$$

$$D = b\cos\left(\alpha - \frac{\pi}{2}\right)$$

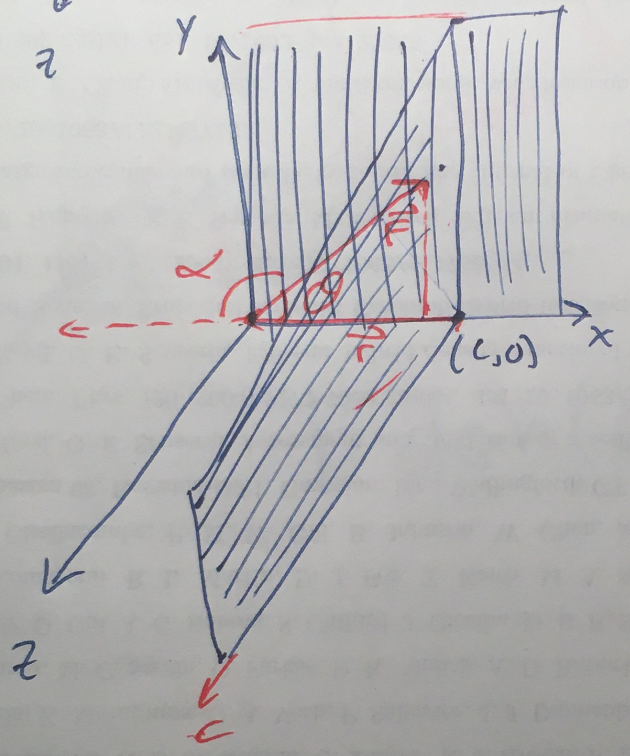
$$D = b\sin(\pi - \alpha)$$

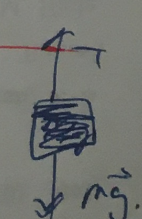
$$= b\sin(\alpha).$$



$$\vec{\tau} = bF\sin\left(\frac{\pi}{2} + \theta\right)$$

C)



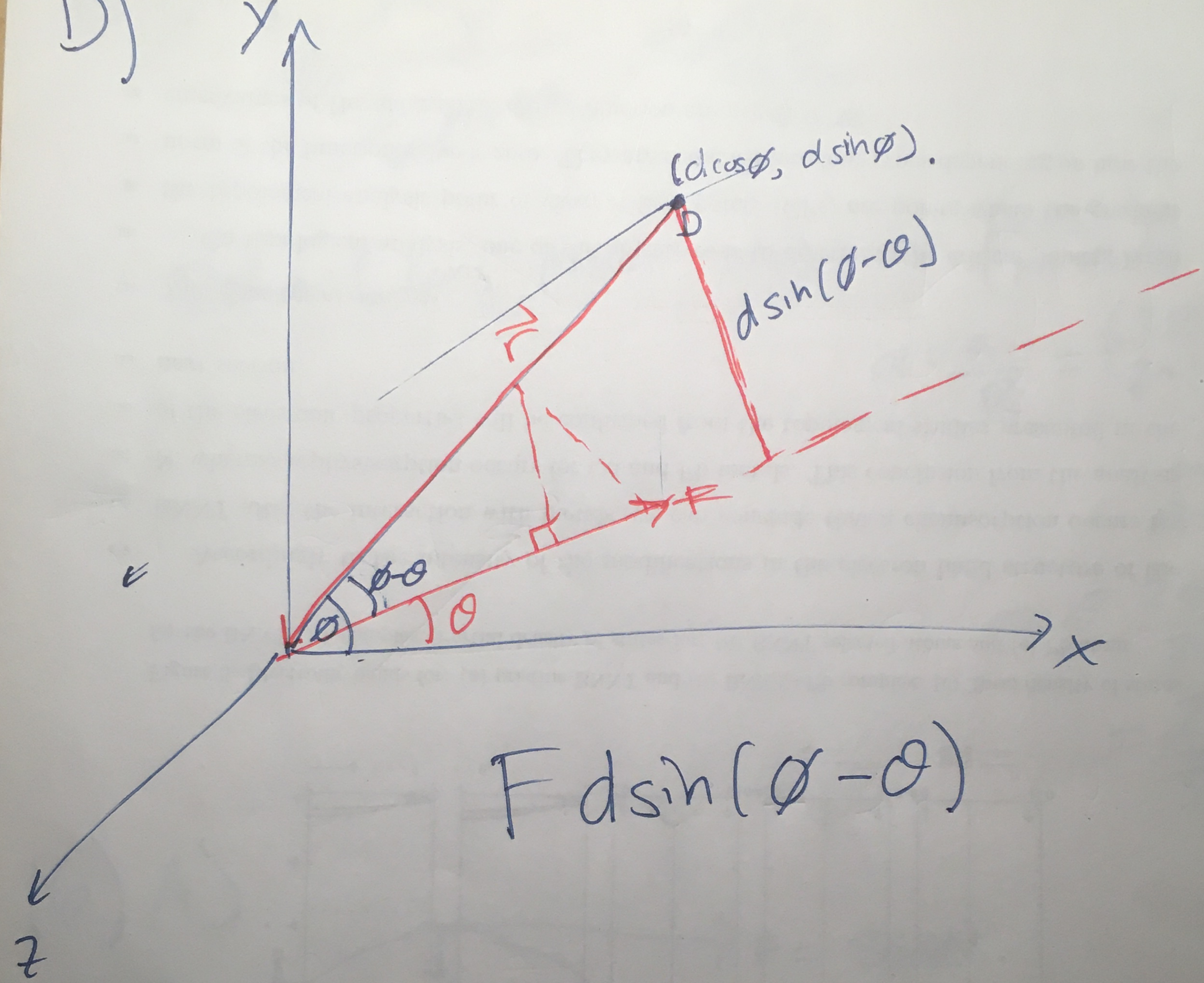


$$\vec{\tau} = cF\sin\theta$$

$$= cF\sin(\alpha)$$

$$= cF\underbrace{\sin(\pi - \theta)}_{= \sin(\theta)}.$$

D)



$$F d \sin(\phi - \theta)$$

15) A)

Before: (Long Answer 3/4) : $a = \left(\frac{2m}{2m+M}\right)g$.

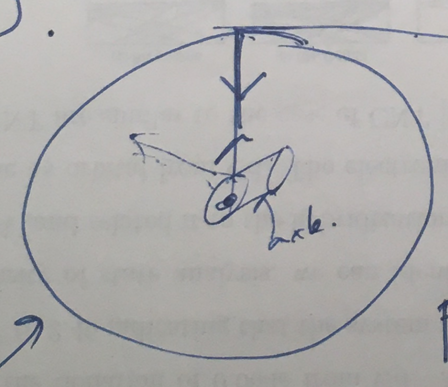
$$\alpha = \frac{a}{R} = \left(\frac{2m}{2m+m}\right)\frac{g}{R}$$

here: $M = m$

$$= \frac{2\cancel{m}g}{3\cancel{m}R}$$

$$= \frac{2g}{3R}.$$

16) A).



$F = 36.0N$.

9.60 kg

0.280 m

$$\tau = I\alpha$$

$$F\cancel{r} = \frac{1}{2}mr^{\cancel{2}}\alpha.$$

$$\frac{2F}{mr} = \alpha. = 26.8\ \frac{rad}{s^2}$$

B) $a = \alpha r = 26.8... \times 0.28 = 7.50$

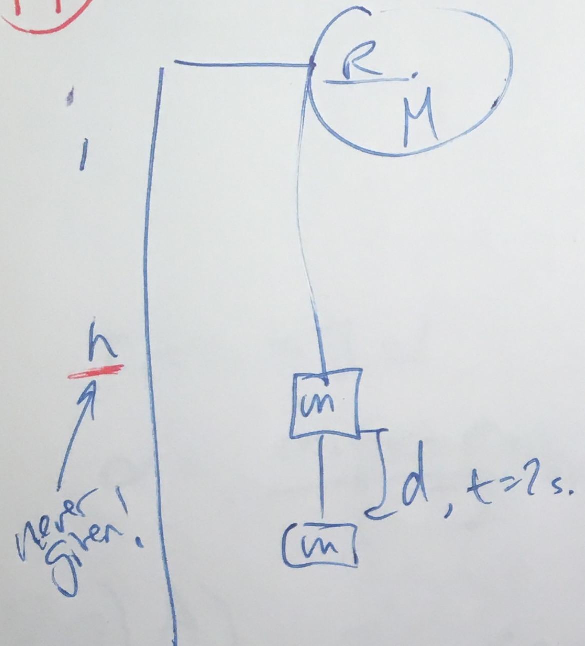
~~10:00 : So you can write things as sum of 3 cubes, 4 cubes 5 cubes, for all n~~

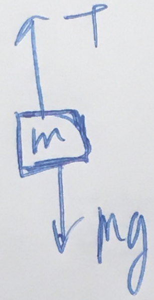
~~remove. In fact Hardy proved.....~~

~~Add to~~

~~22:18 → "oops" red lite went up too early~~

19 ~~28:08 "it would have to divide the base, so you'd need 3 to divide the base" ~28:13~~





$mg - T = ma.$

$T = -ma + mg.$

$T = m(g-a).$

$\boxed{m = \frac{T}{g-a}}$

$d = \cancel{v_i t}_{0.} + \frac{1}{2}at^2$

$d = \frac{1}{2}at^2$

$a = \frac{2d}{t^2}$

$T = m\left(g - \frac{2d}{t^2}\right)$

tension.

$\alpha R = a$

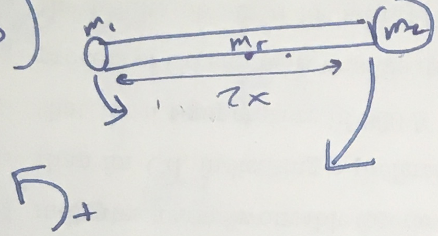
$\alpha = \frac{a}{R} = \frac{\tau}{I} = \frac{TR}{I} = \frac{TR}{\frac{MR^2}{2}}$

$\frac{a}{\cancel{R}} = \frac{2T}{M\cancel{R}}$

$\boxed{T = \frac{Ma}{2}}$

19A) $I = m_1 x^2 + m_2 x^2 + \frac{1}{2} m_r (2x)^2$

B)



$\tau_1 = +Fx = +m_1 g x$

$\vec{\tau} = +\vec{F} \times \vec{r}$

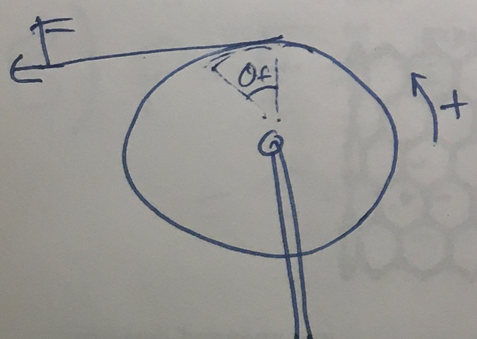
$= +|\vec{F}||\vec{r}|\underbrace{\sin\theta}_{\sin(90^\circ)=1.}$

$\tau_2 = -m_2 g x$

$\tau_1 + \tau_2 = I\alpha$

$\alpha = \frac{m_1 g x - m_2 g x}{I} = \frac{g x (m_1 - m_2)}{I}$

20) A)



$x_f - x_i = v_1 t + \frac{1}{2} a t^2$

$\theta_f - \cancel{\theta_i}^{\,0} = \underline{\omega_0} t + \frac{1}{2} \underline{\alpha} t^2$

$\alpha = \frac{\tau}{I} = \frac{F\cancel{r}}{kmr^{\cancel{2}}}$

$\underline{\theta_f} = \omega_0 t_L + \frac{F t_L^2}{2kmr}$

$\theta_f r = L$

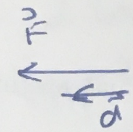
$\frac{L}{r} = \omega_0 t_L + \frac{F t_L^2}{2kmr}$ => solve for k.

$\omega_f^2 = \omega_0^2 + 2\alpha\theta_f$

$= \omega_0^2 + 2\left(\frac{F\cancel{r}}{I}\right)\frac{L}{\cancel{r}}$

$= \sqrt{\omega_0^2 + \frac{2FL}{I}}$

20A) Using W/KE theorem:



$$W = |\vec{F}||\vec{d}| \cancelto{1}{\cos\theta}$$

$$= FL$$

$$\Delta K = FL.$$

$$K_f - K_i = FL$$

$$\underline{K_f = FL + \frac{1}{2} I \omega_0^2}$$

$$K_f = \frac{1}{2}\omega_f^2 I = FL + \frac{1}{2} I\omega_0^2$$

$$\omega_f^2 = \sqrt{\frac{2FL + I\omega_0^2}{I}}$$

$$\omega_f =$$

B) $P = \frac{E}{t} = \frac{W}{t} = \frac{FL}{t_L}$

$$= \tau\omega$$

$$\omega\tau = F\omega_0$$