Mammoth Q's

① $m = 300t^2 + 30000\ N\text{-}m \qquad t = 2s$

$r_B = 2m \qquad r_A = 0.5m$

$m = Fr_B$

~~$F_y = 150t^2 + 15000\ N - mg$~~

~~$ma = 150t^2 + 15000\ N\text{-}m$~~

~~$a = \frac{150}{5440}t^2 + \frac{15000}{5440}$~~

~~$\int_{t_1}^{t_2} a = \frac{150}{16320}t^3 + \frac{15000}{5440}t \Big|_0^2 = 5.588\ m/s = v_f$~~

$F_y = 150t^2 + 15000 - mg$

$(5440)a = 150t^2 - 38366.4$

$a = \frac{150t^2}{5440} - 7.0526 \qquad \int_{t_1}^{t_2} a = \frac{150}{16320}t^3 - 7.0526t \Big|_0^2$

$\Delta v = -13.36\ m/s = v_f$

☆ $r_B = 0.5m$ ☆

$F_y = 600t^2 + 60000 - mg$

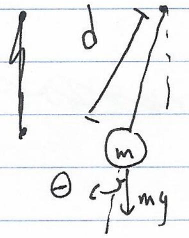
$a = \frac{600t^2}{5440} + \frac{60000 - mg}{5440} \qquad \int_{t_1}^{t_2} a = \frac{600}{16320}t^3 + \frac{60000 - mg}{5440}t \Big|_0^2$

$\Delta V = 2.733\ m/s = v_f$

Assuming that the mammoth swings about A?

② $I = mk^2$ $\quad I_A = mk^2 + m(d^2)$ $\quad d = 2m$

$k = 3.2m$



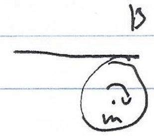
$\Sigma M_A : -dmg\sin\theta = (mk^2 + md^2)\ddot{\theta}$

assume small θ so $\sin\theta = \theta$

$dmg\theta + (mk^2 + md^2)\ddot{\theta} = 0$

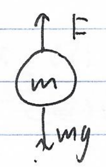
$$w_n = \sqrt{\frac{mgd}{(mk^2+md^2)}} = \sqrt{\frac{gd}{(k^2+d^2)}} = 1.378 \text{ rad/s}$$

③ Does the mammoth not fall down?



$m = 40000$ Nm

$F_r = m$ $\quad F = 20000N$



$F_y: 20000 - mg = ma$ $\quad a = -6.1335 \, m/s^2$

~~$r_b = 0.5m$~~

☆ $r_b = 0.5m$ ☆

$m = 40000$ Nm

$F_r = m$ $\quad F =$ ~~[illegible]~~ $80000N$

$F_y: F - mg = ma$ $\quad a = 4.896 \, m/s^2$

$d = v_i * t + \frac{1}{2} * at^2$ $\quad t = \sqrt{\frac{2d}{a}} = 1.278$

$v_f = v_i + at$ $\quad v_f = 6.258 \, m/s$

⑤ $M_f = -2000\ Nm$

$M = Fr$

impulse $= F\Delta t = m\Delta V$

$\frac{\cancel{2000}}{r}$ $\qquad$ $\xrightarrow{\frac{M}{r}}$

$$\left(\frac{M}{r_B} - \frac{2000}{r_A}\right) = \frac{m\Delta V}{\Delta t}$$

$V_A = s \sin\theta$

~~20-P-MUM-JIE-445~~