HW Jan 31, Johannes Byle

3.14 $m\dot{v} = -\dot{m}v_{ex} + F^{ext}$
$\dot{v} = \frac{kv_{ex}}{m} - \frac{b}{m}v$
$v = e^{-\frac{b}{m}t}(\int e^{\frac{b}{m}t}\frac{kv_{ex}}{m}dt + C)$
$v = \frac{kv_{ex}}{m}e^{-\frac{b}{m}t}(\int e^{\frac{b}{m}t}dt + C)$
$v = \frac{kv_{ex}}{m}e^{-\frac{b}{m}t}(\frac{m}{b}e^{\frac{b}{m}t} + C)$
$v(0) = \frac{kv_{ex}}{m}(\frac{m}{b} + C) = 0$
$C = -\frac{m}{b}$
$v = \frac{kv_{ex}}{m}e^{-\frac{b}{m}t}(\frac{m}{b}e^{\frac{b}{m}t} - \frac{m}{b})$
$v = \frac{kv_{ex}}{b}(1 - e^{-\frac{b}{m}t})$
$v = \frac{kv_{ex}}{b}(1 - (\frac{m}{m_0})^{\frac{b}{m}})$
3.21 $\theta = \frac{\pi}{2}$
$r = \frac{1}{M}\int_0^\theta \int_0^R rsin\theta r dr d\theta$
$r = \frac{4}{3\pi}R$
3.25 $L = mr^2\omega$
$L_1 = L_2 = mr_1^2\omega_1 = mr_2^2\omega_2$
$\omega_2 = \frac{r_1^2\omega_1}{r_2^2}$
3.34 $t = \frac{2v_0}{g} = \frac{n2\pi}{\omega_0}$
$v_0 = \frac{n\pi g}{\omega_0}$