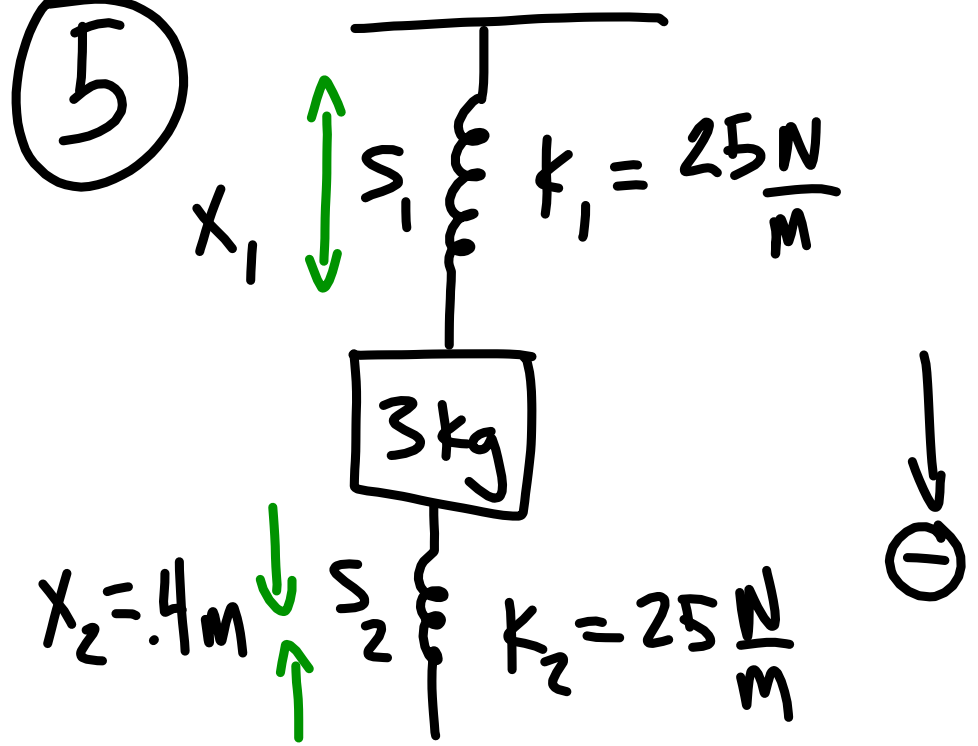
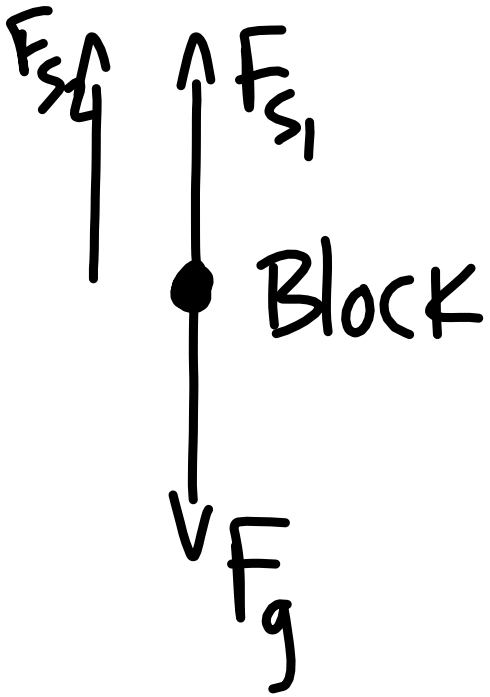
5





$$\sum \vec{F}_y = F_{s_1} + F_{s_2} - F_g = 0$$

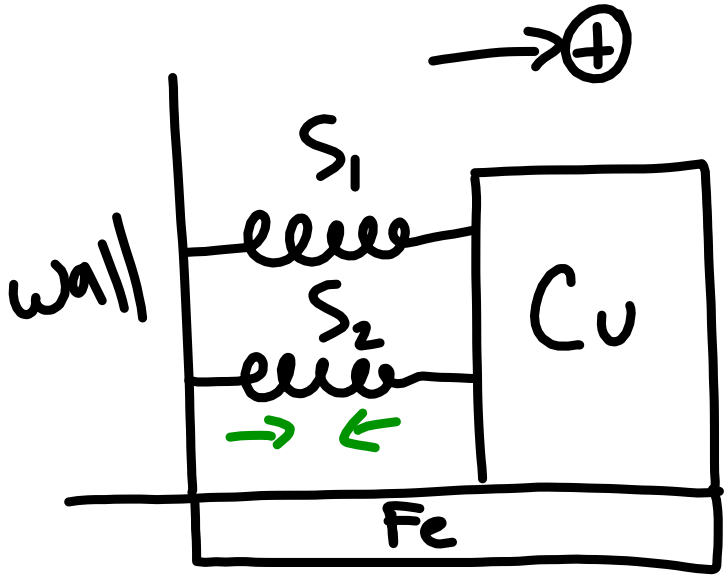
$$k_1 x_1 + k_2 x_2 - mg = 0$$

$$k_1 x_1 = mg - k_2 x_2$$

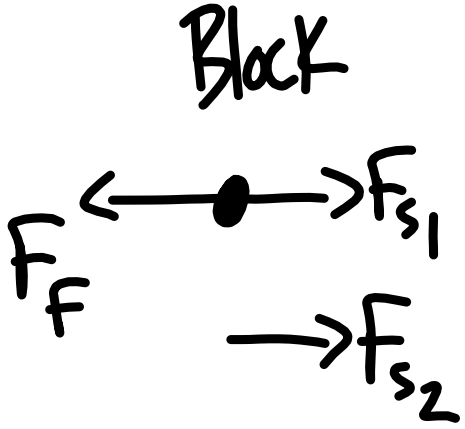
$$x_1 = \frac{mg - k_2 x_2}{k_1}$$

$$x_1 = \frac{(3)(9.81) - (25)(.4)}{25} = 0.777\,m$$

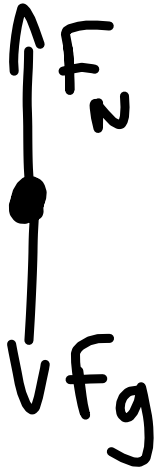
6



$X_1 = X_2 = 0.12\,m$



$\rho_{Cu} = 8.96 \frac{g}{cm^3}$ $\mu = 0.53$



$$\Sigma \vec{F}_x = F_{s_1} + F_{s_2} - F_f = 0$$

$$k_1 x_1 + k_2 x_2 - \mu F_N = 0$$

$$k_1 x + k_2 x - \mu m g = 0$$

$$k_1 x + k_2 x - \mu \rho V g = 0 \qquad \rho = \frac{m}{V} \quad \rho V = m$$

$$(4500)(.12) + (5000)(.12) - (.53)(.00896)(.000215)(9.81)$$

$$= 1{,}130 \text{ N} \approx \boxed{1{,}100 \text{ N}}$$

$$F_g = \frac{G m_1 m_2}{r^2}$$

$m_1, m_2 \rightsquigarrow$ masses

Universal Gravitation 6.67×10^{-11}

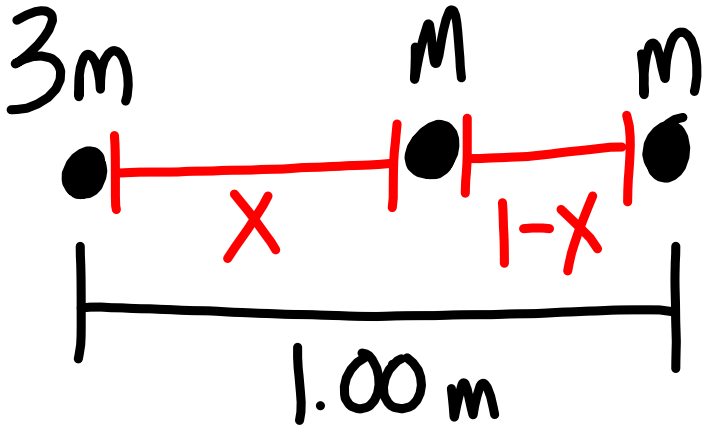
$r \rightsquigarrow$ distance between masses

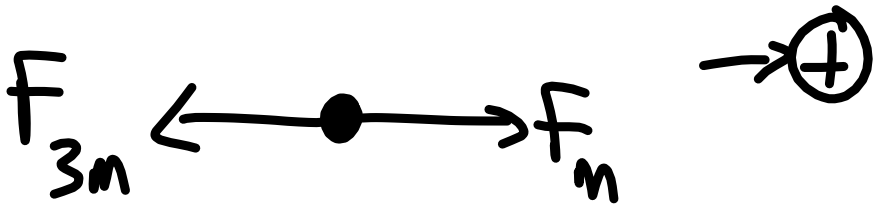
$$F_g = \frac{G m_1 m_2}{r^2} = m_1 g$$

$m_2 \sim$ MASS-O-Earth

$$\frac{G M_\oplus}{r^2} = g$$

3





$$\Sigma \vec{F}_x = F_m - F_{3m} = 0$$

$$F_m = F_{3m}$$

$$\frac{G3mM}{x^2} = \frac{GmM}{(1-x)^2}$$

$$\frac{3}{x^2} = \frac{1}{(1-x)^2}$$

$$3(1-x)^2 = x^2$$

$$3(1-x)(1-x) = x^2$$

$$3(1-2x+x^2) = x^2$$

$$3(1-2x+x^2)=x^2$$

$$3-6x+3x^2=x^2$$

$$3-6x+2x^2=0$$

Graph $\rightarrow$ $x=0.63397 \approx 0.634\ m$

(4) a) $F_g = \frac{G m_1 m_2}{r^2} = m_1 g$

$$\frac{G M_\oplus}{r^2} = g$$

b) $F_{g_1} = mg$

$F_{g_1} = (65)(9.81)$ $F_{g_2} = (65)(4.905)$

$F_{g_2} = 318.825$

$$F_g = \frac{G m_1 M_\oplus}{r^2}$$

$$318.825 = \frac{(6.67\times10^{-11})(65)(5.98\times10^{24})}{r^2}$$

$$r = 9.02\times10^{6}\ m$$

$$9.02\times10^{6} - \underbrace{6.37\times10^{6}}_{r_\oplus} = 2.65\times10^{6}\ m$$

$$\frac{G\cancel{m}M_\oplus}{(r_\oplus+x)^2}=\frac{\cancel{m}g}{2}$$

$$\frac{GM_\oplus}{(r_\oplus+x)^2}=\frac{g}{2}$$

$$GM_\oplus 2=g(r_\oplus+x)^2$$

$$GM_\oplus 2=g(r_\oplus+x)(r_\oplus+x)$$

$GM_\oplus$