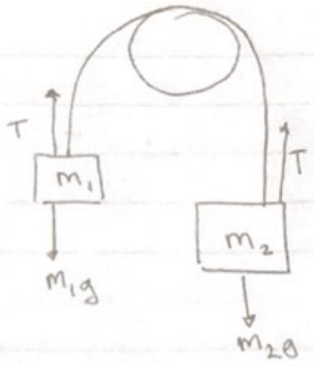
Dynamics

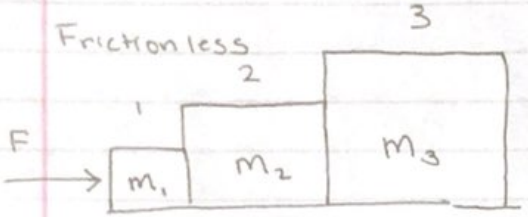
Pulley:



$$a = \frac{\sum F}{m_T} = \frac{m_2 g - m_1 g}{m_1 + m_2}$$

$$T = m_2 g - m_2 a = m_1 g + m_1 a$$

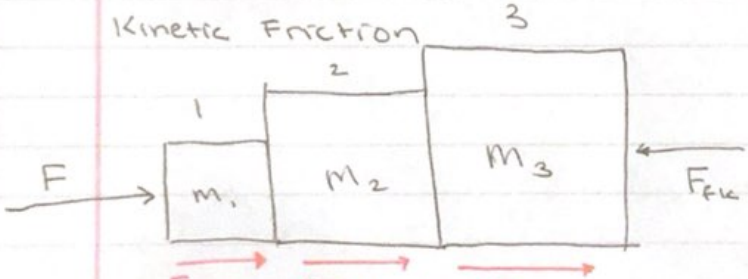
Frictionless



$$F_{1 on 2} = \frac{m_2 + m_3}{m_T} \cdot F$$

$$F_{2 on 3} = \frac{m_3}{m_T} F$$

Kinetic Friction



$F_{net\ on\ 1}$ $F_{net\ 1 on 2}$ $F_{net\ 2 on 3}$

$F_{fk_1} = a_f \cdot m_1$ $F_{fk_2} = a_f \cdot m_2$ $F_{fk_3} = a_f \cdot m_3$

$$\mu k \cdot N = F_{fk}$$

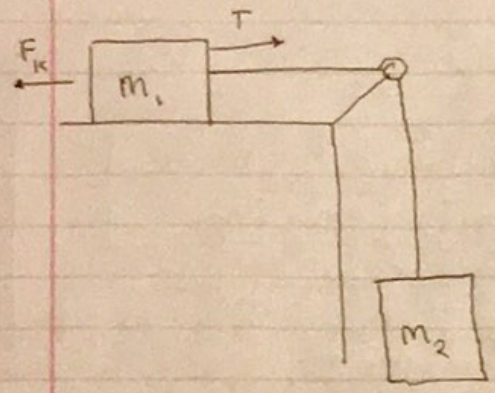
$$a_{net} = \frac{F - F_{fk}}{M_T} = \frac{\sum F}{M_T}$$

$$a_{fric} = \frac{F_{fk}}{m_T}$$

$$F_{c\ 1 on 2} = F - F_{net\ on 1} - F_{fk_1}$$

$$F_{c\ 2 on 3} = F_{c\ 2 on 2} - F_{net\ 1 on 2} - F_{fk2}$$

Pulley 2: Friction



$$a = \frac{\sum F}{m} = \frac{m_2 g - f_K}{m_1 + m_2}$$

$$\sum F_x = T - f_K$$

$$T = m_1 a + f_K = m_2 a + m_2 g$$