

Phys 111
Homework

4-45



Given

$$m_1 = 1.0 \text{ kg}$$

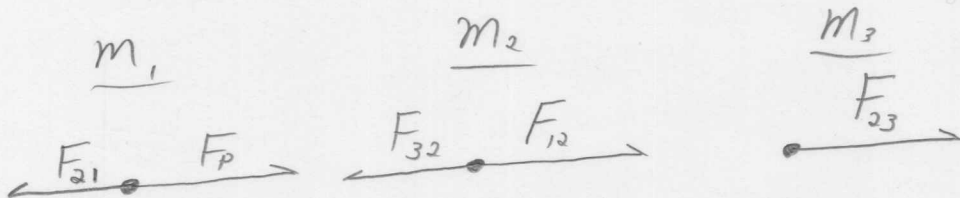
$$m_2 = 2.0 \text{ kg}$$

$$m_3 = 3.0 \text{ kg}$$

$$F = 12 \text{ N}$$

Want

$$F_{23}$$



Newton's Second Law : $\sum \vec{F} = m\vec{a}$

$$\textcircled{1} F_p - F_{21} = m_1 a \quad \textcircled{2} F_{12} - F_{32} = m_2 a \quad \textcircled{3} F_{23} = m_3 a$$

add eq ① and eq ② :

$$F_p - \cancel{F_{21}} + \cancel{F_{12}} - F_{32} = m_1 a + m_2 a$$

$$\textcircled{4} F_p - F_{32} = a(m_1 + m_2)$$

divide eq ③ by eq ④

$$\frac{F_{23}}{F_p - F_{32}} = \frac{\cancel{m_3}}{\cancel{m_1 + m_2}} \Rightarrow (m_1 + m_2) F_{23} = F_p m_3 - F_{32} m_3$$

$$F_{23} = \frac{m_3}{m_1 + m_2 + m_3} F_p = \frac{3}{1 + 2 + 3} \cdot 12 = \boxed{6 \text{ N}}$$