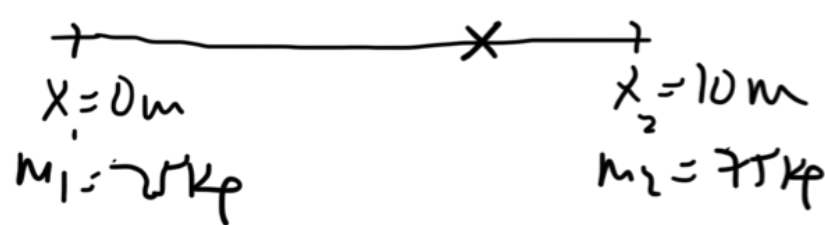


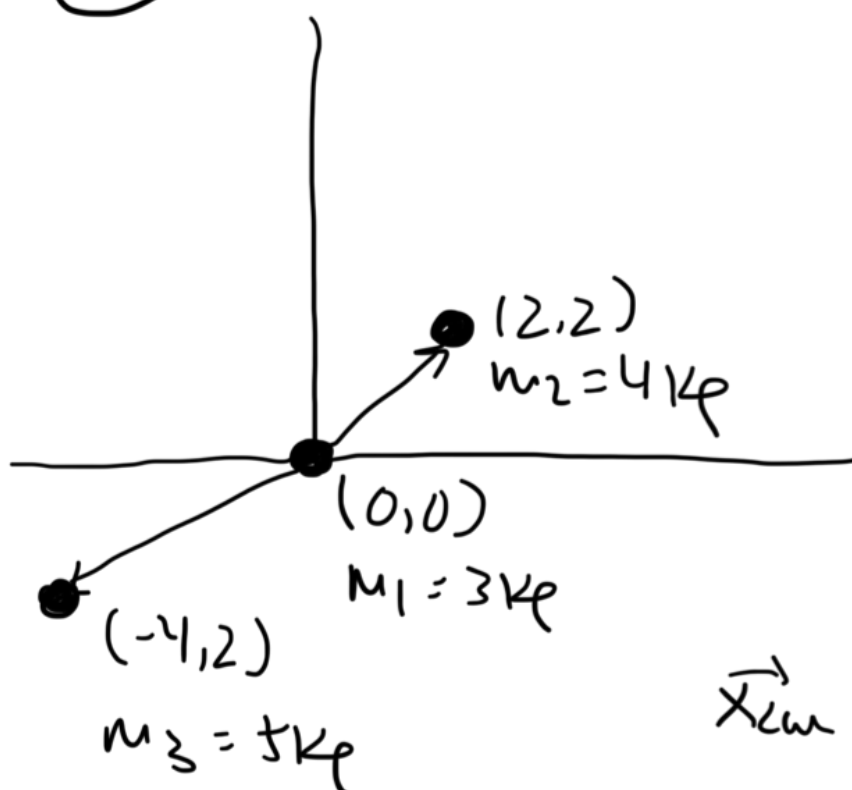
Activitats finals Unitat 7

1)



$$\vec{x}_{cm} = \frac{m_1 x_1 + m_2 x_2}{(m_1 + m_2)} = \frac{0 + 10 \cdot 75}{(25 + 75)} = [7,5 \text{ m}]$$

2)



$$\vec{x}_{cm} = \frac{m_1 x_1 + m_2 x_2 + m_3 x_3}{(m_1 + m_2 + m_3)}$$

$$\vec{x}_{cm} = \frac{3(0,0) + 4(2,2) + 5(-4,2)}{(3 + 4 + 5)}$$

$$\vec{x}_{cm} = \frac{(0,0) + (8,8) + (-20,10)}{12}$$

$$\vec{x}_{cm} = \frac{(-12, 18)}{12} = [(-1, 1.5) \text{ m}]$$

3)

$$\vec{v}_{cm} = \frac{m_1 v_1 + m_2 v_2}{(m_1 + m_2)} = \frac{10 \cdot (4\vec{i}) + 15 \cdot 2\vec{i}}{(10 + 15)} = \frac{-10\vec{i}}{25} = -0,4\vec{i}$$

$$\vec{v}_{cm} = (-0,4, 0) \text{ m/s}$$

4)

$$a) \vec{v}_{cm} = \frac{m_1 v_1 + m_2 v_2 + m_3 v_3}{(m_1 + m_2 + m_3)} = \frac{5(2,3) + 3(5,-6) + 4(-3,4)}{(5 + 3 + 4)}$$

$$\vec{v}_{cm} = \frac{(10,15) + (15,-18) + (-12,16)}{12} = \left[\frac{13}{12} \vec{i} + \frac{13}{12} \vec{j} \text{ (m/s)} \right]$$

b)

$$\vec{P} = M \cdot \vec{v}_{cm} = 12 \cdot \left(\frac{13}{12}, \frac{13}{12} \right) = \left[13\vec{i} + 13\vec{j} \left(\frac{\text{kg} \cdot \text{m}}{\text{s}} \right) \right]$$

5)

$\vec{v}_{cm} = 0 \text{ m/s}$ i estan junts
m al estat de llibre

$$\vec{v}_{cm} = \frac{m_1 v_1 + m_2 v_2}{(m_1 + m_2)} = \frac{90v_1 + 60 \cdot 1}{150} = 0$$

$$v_1 = \frac{-60}{90} = [-0,66 \text{ m/s}]$$

6)

$$\vec{F}_{ext} = m \vec{a}$$

$$\vec{a}_1 = \frac{3\vec{i} - 4\vec{j}}{4} = \frac{3}{4}\vec{i} - 1\vec{j} \text{ (m/s}^2\text{)}$$

$$\vec{a}_2 = \frac{3\vec{i} - 4\vec{j}}{6} = \frac{1}{2}\vec{i} - \frac{2}{3}\vec{j} \text{ (m/s}^2\text{)}$$

$$\vec{a}_{cm} = \frac{m_1 \vec{a}_1 + m_2 \vec{a}_2}{(m_1 + m_2)} = \frac{4 \left(\frac{3}{4}, -1 \right) + 6 \left(\frac{1}{2}, -\frac{2}{3} \right)}{(4 + 6)}$$

$$\vec{a}_{cm} = \frac{(3, -4) + (3, -4)}{10} = [0,6\vec{i} - 0,8\vec{j} \text{ (m/s}^2\text{)}]$$

$$|\vec{a}_{cm}| = \sqrt{(0,6)^2 + (-0,8)^2} = \sqrt{1} = [1 \text{ m/s}^2]$$

7)

$$\vec{x}_{cm} = \frac{m_H \cdot x_H + m_{e^-} x_{e^-}}{(m_H + m_{e^-})} = \frac{1 \cdot 0 + 35,5 \cdot 1,3 \cdot 10^{-10}}{(1 + 35,5)}$$

$$\vec{x}_{cm} = \frac{4,615 \cdot 10^{-9}}{36,5} = [1,26 \cdot 10^{-10} \text{ m}]$$