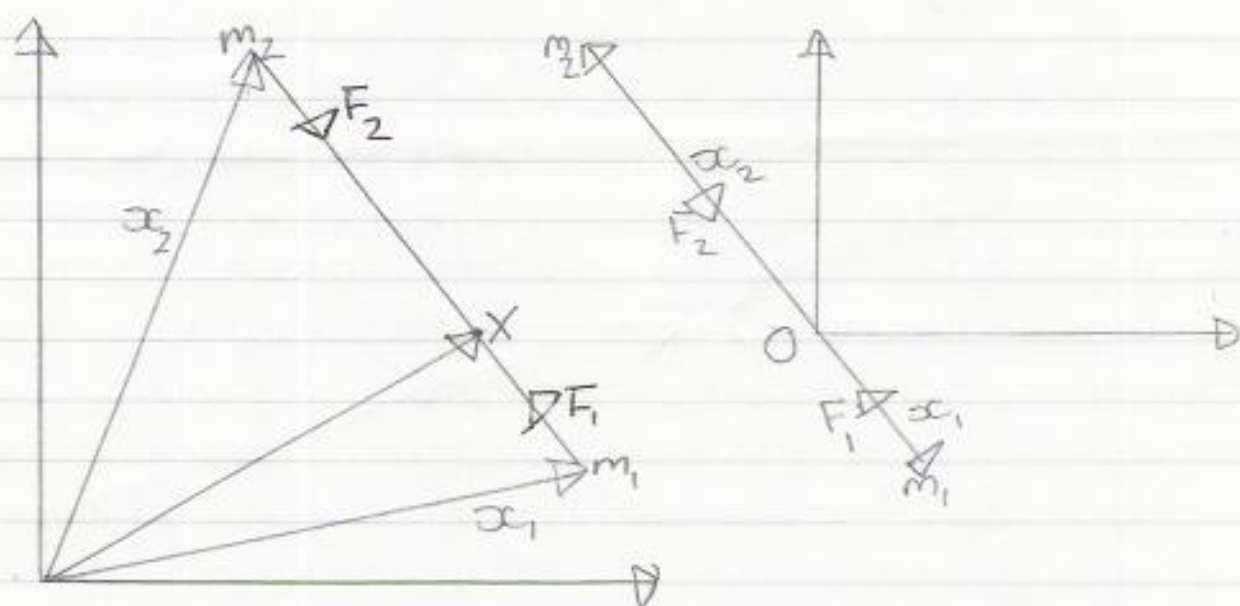


5. Other inertial frames are identically calibrated.

ii)



From Newton's Second Law for m_2

$$m_2 a_2 = F_2$$

and for m_1 ,

$$m_1 a_1 = F_1$$

F_1 and F_2 act along the line joining m_1 to m_2 . From Newton's third law, F_1 and F_2 are equal in magnitude and opposite in direction, so

$$F_1 + F_2 = 0 \quad (1)$$

The centre of mass of the system is given by $m_1(X - x_1) = m_2(x_2 - X)$ where X is the coordinate of the centre of mass on the line joining m_1 to m_2

$$m_1 X - m_1 x_1 = m_2 x_2 - m_2 X$$

$$m_1 X + m_2 X = m_1 x_1 + m_2 x_2$$

$$X(m_1 + m_2) = m_1 x_1 + m_2 x_2$$

$$X = \frac{m_1 x_1 + m_2 x_2}{m_1 + m_2}$$

We may consider the system as a single particle positioned at the point X , and since from (1) the net force on the system is zero, from Newton's