

SM5083

Assignment Number 2

H.N Srikanth
SM21MTECH12012

1. CHAPTER III MISCELLANEOUS EXAMPLES VI Q.11

Show that the lines $l_1x + m_1y + n_1 = 0$, $l_2x + m_2y + n_2 = 0$ will be equally inclined in the opposite direction if

$$\frac{m_1}{l_1} + \frac{m_2}{l_2} = 2\cos w$$

, where w is the angle between the axes.

Solution :

Given :

$$\frac{m_1}{l_1} + \frac{m_2}{l_2} = 2\cos w$$

Here w is the angle between the axes

To prove : $l_1x + m_1y + n_1 = 0$, $l_2x + m_2y + n_2 = 0$ will be equally inclined in the opposite direction. This implies magnitudes of slopes of $l_1x + m_1y + n_1 = 0$, $l_2x + m_2y + n_2 = 0$ are equal.

From given condition

$$\frac{m_1}{l_1} + \frac{m_2}{l_2} = 2\cos w$$

$$\frac{m_1l_2 + m_2l_1}{l_1l_2} = 2\cos w$$

$$\frac{m_1l_2 + m_2l_1}{m_1m_2} = 2\frac{l_1l_2}{m_1m_2}\cos w$$

$$\frac{l_1}{m_1} + \frac{l_2}{m_2} = 2\frac{l_1l_2}{m_1m_2}\cos w \quad (1)$$

let

$$a_1 = \frac{-l_1}{m_1} \quad (2)$$

$$a_2 = \frac{-l_2}{m_2} \quad (3)$$

Here a_1, a_2 are slopes of the lines in transformed axes. By substituting (2) and (3) in (1)

$$a_1 + a_2 = -2a_1a_2\cos w$$

$$a_1 + a_1a_2\cos w = -a_2 - a_1a_2\cos w$$

$$\frac{a_1\sin w}{1 + a_1\cos w} = \frac{-a_2\sin w}{1 + a_2\cos w} \quad (4)$$

(4) shows the equivalent slopes of lines $l_1x + m_1y + n_1 = 0$, $l_2x + m_2y + n_2 = 0$ in cartesian axes

(4) also depicts that slopes are equal and lines are in opposite direction.

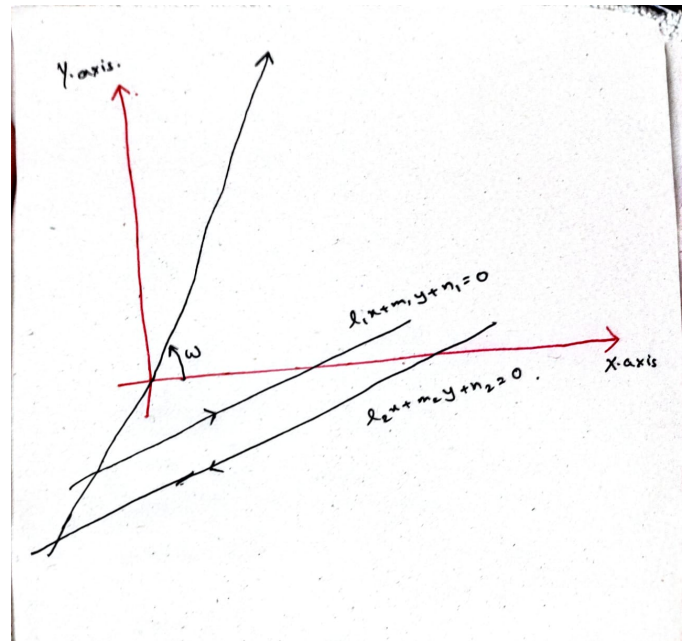


Fig. 0.