Quiz 8

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***Abstract*—This document contains the solution of the question from NCERT 12th standard chapter 11 exercise 11.2 problem 13**

1 Exercise 11.2

1) Show that the lines $\frac{x-5}{7} = \frac{y+2}{-5} = \frac{z}{1}$ and $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ are perpendicular to each other.
The direction vector of the line

$$\frac{x-5}{7} = \frac{y+2}{-5} = \frac{z}{1} \tag{1.0.1}$$

is

$$\mathbf{m_1} = \begin{pmatrix} 7 \\ -5 \\ 1 \end{pmatrix} \tag{1.0.2}$$

The direction vector of the line

$$\frac{x}{1} = \frac{y}{2} = \frac{z}{3} \tag{1.0.3}$$

is

$$\mathbf{m_2} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} \tag{1.0.4}$$

$$\mathbf{m_1}^\top \mathbf{m_2} = \begin{pmatrix} 7 & -5 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} \tag{1.0.5}$$

$$= 7 + (-5)(2) + (1)(3) \tag{1.0.6}$$

$$= 7 - 10 + 3 = 0 \tag{1.0.7}$$

$\mathbf{m_1}^\top \mathbf{m_2} = 0$ implies that $\mathbf{m_1}$ and $\mathbf{m_2}$ are perpendicular.
Hence, the two lines are perpendicular.