

# Assignment 1

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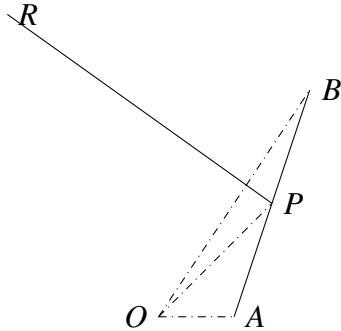
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[https://github.com/EE20RESCH14003/Assignment-1\\_5](https://github.com/EE20RESCH14003/Assignment-1_5)

## 1 QUESTION No. 62

A line perpendicular to the line segment joining the points (1,0) and (2,3) divides it into the ratio 1:n. Find the equation of the line.

### 1.1 Solution



Given that

$$A = \begin{pmatrix} 1 \\ 0 \end{pmatrix} \text{ and } B = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \quad (1.1.1)$$

The line RP intersect the line AB in 1:n ration, using section formula

$$P = \frac{B + nA}{n + 1} \quad (1.1.2)$$

Using equations (1.1.1) and (1.1.3),

$$P = \begin{pmatrix} \frac{n+2}{n+1} \\ \frac{3}{n+1} \end{pmatrix} \quad (1.1.3)$$

Direction vector of line AB

$$\mathbf{m} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} - \begin{pmatrix} 1 \\ 0 \end{pmatrix} = \begin{pmatrix} 1 \\ 3 \end{pmatrix} \quad (1.1.4)$$

Let  $\mathbf{x}$  is the point on line PR, direction vector of line PR will be  $(\mathbf{x} - \mathbf{P})$

Since line AB and line PR are perpendicular to each other, dot product of direction vectors will be zero.

Therefore,

$$\begin{pmatrix} m \end{pmatrix}^T (\mathbf{x} - \mathbf{P}) = 0 \quad (1.1.5)$$

Putting the values of m, x and P in equation (1.1.5)

$$\begin{pmatrix} 1 \\ 3 \end{pmatrix}^T \left( \begin{pmatrix} x \\ y \end{pmatrix} - \begin{pmatrix} \frac{n+2}{n+1} \\ \frac{3}{n+1} \end{pmatrix} \right) = 0 \quad (1.1.6)$$

Solving the equation (1.1.6), equation of the line PR is

$$x + 3y = \frac{11n + 1}{n + 1} \quad (1.1.7)$$