Straight Lines

11th Maths - Chapter 10

The following problem is question 13 from exercise 10.3:

1. Find the equation of the right bisector of the line segment joining the points (3, 4) and (−1, 2).

Solution:
Given that

$$\mathbf{A} = \begin{pmatrix} 3 \\ 4 \end{pmatrix} \tag{1}$$

$$\mathbf{B} = \begin{pmatrix} -1 \\ 2 \end{pmatrix} \tag{2}$$

$$\tag{3}$$

The midpoint is given by

$$\mathbf{M} = \frac{1}{2}(\mathbf{OA} + \mathbf{OB}) \tag{4}$$

$$= \frac{1}{2}\begin{pmatrix} 3 - 1 \\ 4 + 2 \end{pmatrix} \tag{5}$$

$$= \begin{pmatrix} 1 \\ 3 \end{pmatrix} \tag{6}$$

The direction vector is given by

$$\mathbf{d} = (\mathbf{B} - \mathbf{A}) \tag{7}$$

$$= \begin{pmatrix} 2 - 4 \\ -1 - 3 \end{pmatrix} \tag{8}$$

$$= \begin{pmatrix} -2 \\ -4 \end{pmatrix} \tag{9}$$

The slope of the perpendicular bisector is the negative reciprocal of the slope of line segment

$$= \frac{-2}{-4} \tag{10}$$

$$= \frac{1}{2} \tag{11}$$

So, The slope of the perpendicular bisector is -2
Equation of line

$$(y - y_1) = m(x - x_1) \tag{12}$$
$$(y - 3) = -2(x - 1) \tag{13}$$
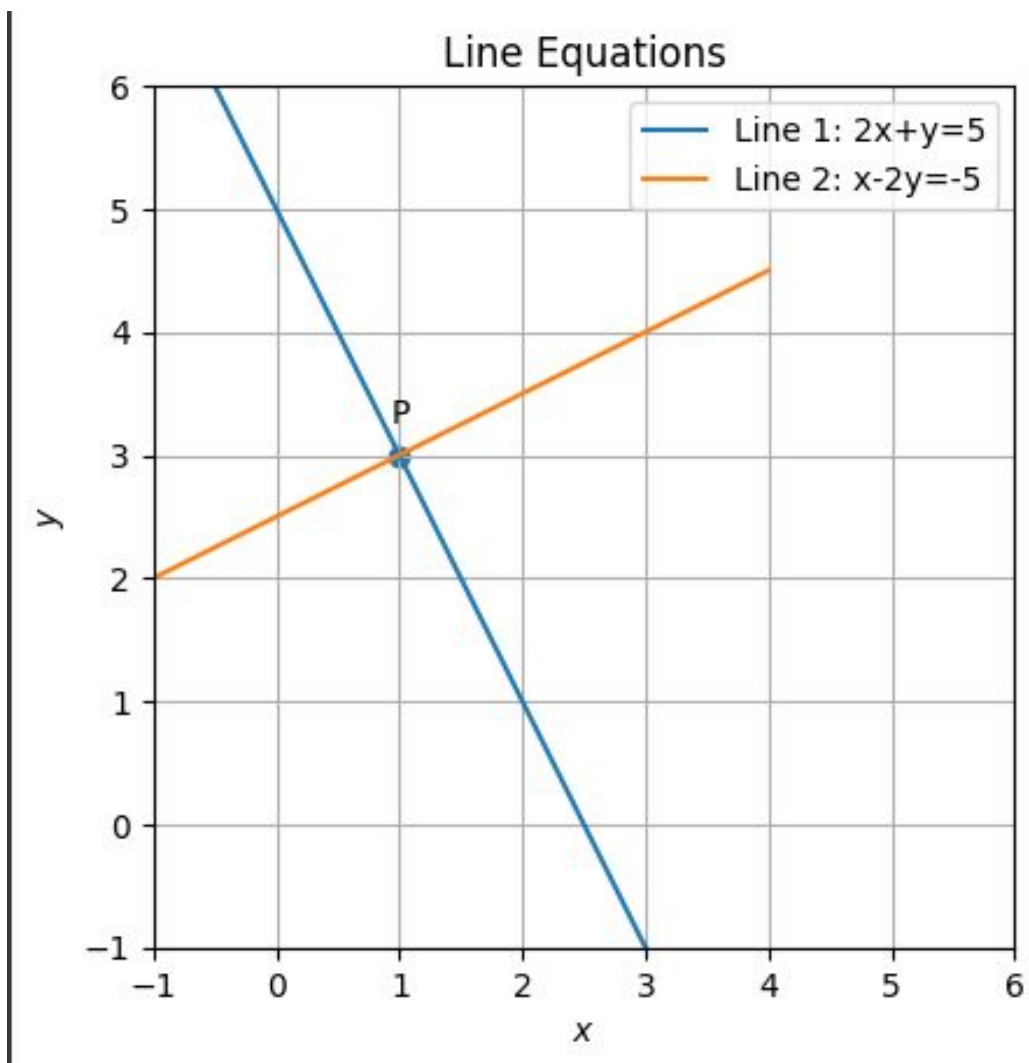$$y = -2x + 5 \tag{14}$$
$$2x + y = 5 \tag{15}$$

Figure 1: Graph