

# Activity 20

## OBJECTIVE

To verify that the equation of a line passing through the point of intersection of two lines  $a_1x + b_1y + c_1 = 0$  and  $a_2x + b_2y + c_2 = 0$  is of the form  $(a_1x + b_1y + c_1) + \lambda (a_2x + b_2y + c_2) = 0$ .

## MATERIAL REQUIRED

Cardboard, sketch pen, white paper, adhesive, pencil, ruler.

## METHOD OF CONSTRUCTION

1. Take a cardboard of convenient size and paste a white paper on it.
2. Draw two perpendicular lines  $X'OX$  and  $Y'OY$  on the graph paper. Take same scale for marking points on  $x$  and  $y$ -axes.
3. Draw the graph of the given two intersecting lines and note down the point of intersection, say  $(h, k)$  (see Fig. 20.1)

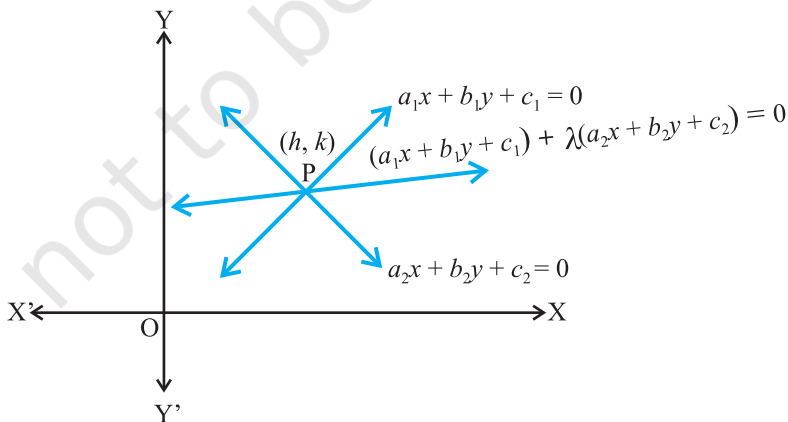


Fig. 20.1

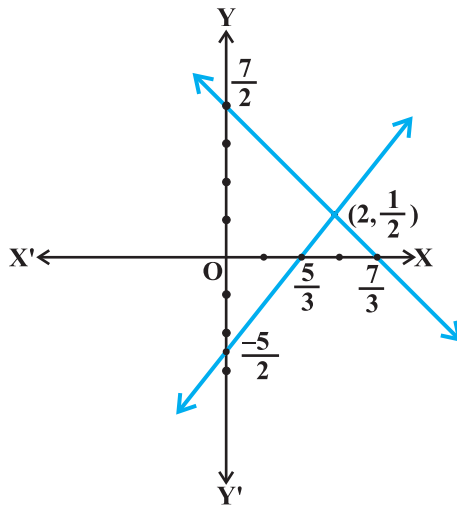


Fig. 20.2

### DEMONSTRATION

- Let the equations of the lines be  $3x - 2y = 5$  and  $3x + 2y = 7$ .
- The point of intersection of these lines is  $\left(2, \frac{1}{2}\right)$  (See Fig. 20.2).
- Equation of the line passing through the point of intersection  $\left(2, \frac{1}{2}\right)$  of these lines is  $(3x - 2y - 5) + \lambda(3x + 2y - 7) = 0$  (1)
- Take  $\lambda = 1, -1, 2, \frac{1}{2}$ .
- (i) For  $\lambda = 1$ , equation of line passing through the point of intersection is  $(3x - 2y - 5) + 1(3x + 2y - 7)$ , i.e.,  $6x - 12 = 0$ , which is satisfied by the point of intersection  $\left(2, \frac{1}{2}\right)$ , i.e.,  $6(2) - 12 = 0$

(ii) For  $\lambda = -1$ , the equation of line passing through the point of intersection is

$(3x - 2y - 5) - 1(3x + 2y - 7) = 0$  is  $-4y + 2 = 0$ , which is also satisfied by the point of intersection  $\left(2, \frac{1}{2}\right)$ .

(iii) For  $\lambda = 2$ , the equation is  $(3x - 2y - 5) + 2(3x + 2y - 7) = 0$ , i.e.,  $9x + 2y - 19 = 0$ , which is again satisfied by the point  $\left(2, \frac{1}{2}\right)$ .

### OBSERVATION

1. For  $\lambda = 3$ , the equation of the line passing through intersection of the lines is \_\_\_\_\_ which is satisfied by the point  $\left(2, \frac{1}{2}\right)$ .
2. For  $\lambda = 4$ , the equation of the line passing through point of the intersection of the lines is \_\_\_\_\_ which is satisfied by the point of intersection \_\_\_\_\_ of the lines.
3. For  $\lambda = 5$ , the equation of the line passing through the intersection of the lines is \_\_\_\_\_ which is satisfied by the point of intersection \_\_\_\_\_ of the lines.

### APPLICATION

The activity can be used in understanding the result relating to the equation of a line through the point of intersection of two given lines. It is also observed that infinitely many lines pass through a fixed point.