

8. Find the height from vertex B to side AC in  $\triangle ABC$ , where the vertices are  $A(3, 6)$ ,  $B(2, -3)$ , and  $C(-1, 4)$ .

**Sol.**

$$\begin{aligned}m_{AC} &= \frac{y_2 - y_1}{x_2 - x_1} \\&= \frac{4 - 6}{-1 - 3} \\&= \frac{-2}{-4} \\&= \frac{1}{2}\end{aligned}$$

$$y - y_A = m_{AC}(x - x_A)$$

$$y - 6 = \frac{1}{2}(x - 3)$$

$$2y - 12 = x - 3$$

$$x - 2y + 9 = 0$$

$$\begin{aligned}d &= \left| \frac{Ax_B + By_B + C}{\sqrt{A^2 + B^2}} \right| \\&= \left| \frac{2 + 6 + 9}{\sqrt{1^2 + (-2)^2}} \right| \\&= \left| \frac{17}{\sqrt{5}} \right| \\&= \frac{17\sqrt{5}}{5}\end{aligned}$$

9. Find the vertices of triangle whose mid point of sides are  $(-2, -5)$ ,  $(-1, 1)$  and  $(4, -1)$ .

**Sol.**

Let the vertices be  $A(x_1, y_1)$ ,  $B(x_2, y_2)$  and  $C(x_3, y_3)$

$$\frac{x_1 + x_2}{2} = -2 \quad (1)$$

$$\frac{x_2 + x_3}{2} = -1 \quad (2)$$

$$\frac{x_3 + x_1}{2} = 4 \quad (3)$$

$$(1) \Rightarrow x_1 + x_2 = -4 \quad (4)$$

$$(2) \Rightarrow x_2 + x_3 = -2 \quad (5)$$

$$(3) \Rightarrow x_3 + x_1 = 8 \quad (6)$$

$$(4) + (5) + (6) \Rightarrow 2x_1 + 2x_2 + 2x_3 = 2$$

$$x_1 + x_2 + x_3 = 1 \quad (7)$$

$$\text{Sub (4) in (7)} \Rightarrow -4 + x_3 = 1$$

$$x_3 = 5$$

$$\text{Sub } x_3 = 5 \text{ in (3)} \Rightarrow x_1 = 3$$

$$\text{Sub } x_3 = 5 \text{ in (2)} \Rightarrow x_2 = -7$$

$$\frac{y_1 + y_2}{2} = -5 \quad (8)$$

$$\frac{y_2 + y_3}{2} = 1 \quad (9)$$

$$\frac{y_3 + y_1}{2} = -1 \quad (10)$$

$$(8) \Rightarrow y_1 + y_2 = -10 \quad (11)$$

$$(9) \Rightarrow y_2 + y_3 = 2 \quad (12)$$

$$(10) \Rightarrow y_3 + y_1 = -2 \quad (13)$$

$$(11) + (12) + (13) \Rightarrow 2y_1 + 2y_2 + 2y_3 = -10$$

$$y_1 + y_2 + y_3 = -5 \quad (14)$$

$$\text{Sub (11) in (14)} \Rightarrow -10 + y_3 = -5 \quad (15)$$

$$y_3 = 5 \quad (16)$$

$$\text{Sub } y_3 = 5 \text{ in (13)} \Rightarrow y_1 = -7 \quad (17)$$

$$\text{Sub } y_3 = 5 \text{ in (12)} \Rightarrow y_2 = -3 \quad (18)$$

$\therefore A(-7, -3)$ ,  $B(3, -7)$  and  $C(5, 5)$

10. If  $(-1, -2)$ ,  $(2, t)$ , and  $(3, 6)$  are on the same line, find the value of  $t$ .

**Sol.**

$$\frac{1}{2} |(-t + 12 - 6) - (-4 + 3t - 6)| = 0$$

$$-t + 6 + 10 - 3t =$$

$$-4t = -16$$

$$t = 4$$