1.9.2

EE24BTECH11021 - Eshan Ray

Question:
The point on the X axis which is equidistant from $(-4,0)$ and $(10,0)$ is...
Solution:

Variable	Description	Formula
$\mathbf{B}(-4,0)$	coordinates of first point	–
$\mathbf{C}(10,0)$	coordinates of second point	–
$\mathbf{A}(a,0)$	Equidistant point of $\mathbf{B}$ and $\mathbf{C}$ on X axis	–

TABLE 0: Input parameters

$$\|\mathbf{B}-\mathbf{A}\|^2 = \|\mathbf{C}-\mathbf{A}\|^2 \tag{1}$$
$$\implies \mathbf{B}^2+\mathbf{A}^2-2\mathbf{A}\mathbf{B}^\top = \mathbf{C}^2+\mathbf{A}^2-2\mathbf{A}\mathbf{C}^\top \tag{2}$$
$$\implies \mathbf{A}\left(\mathbf{C}^\top-\mathbf{B}^\top\right) = \frac{\mathbf{C}^2-\mathbf{B}^2}{2} \tag{3}$$
$$\implies \mathbf{A}\left(\begin{pmatrix}10 & 0\end{pmatrix}-\begin{pmatrix}-4 & 0\end{pmatrix}\right) = \frac{100-16}{2} \tag{4}$$
$$\implies \begin{pmatrix}a\\0\end{pmatrix}\begin{pmatrix}14 & 0\end{pmatrix} = \frac{84}{2} \tag{5}$$
$$\implies 14a = 42 \tag{6}$$
$$\implies a = 3 \tag{7}$$
$$\therefore \mathbf{A} = \begin{pmatrix}3\\0\end{pmatrix} \tag{8}$$

The point equidistant from $(-4,0)$ and $(10,0)$ is $(3,0)$.

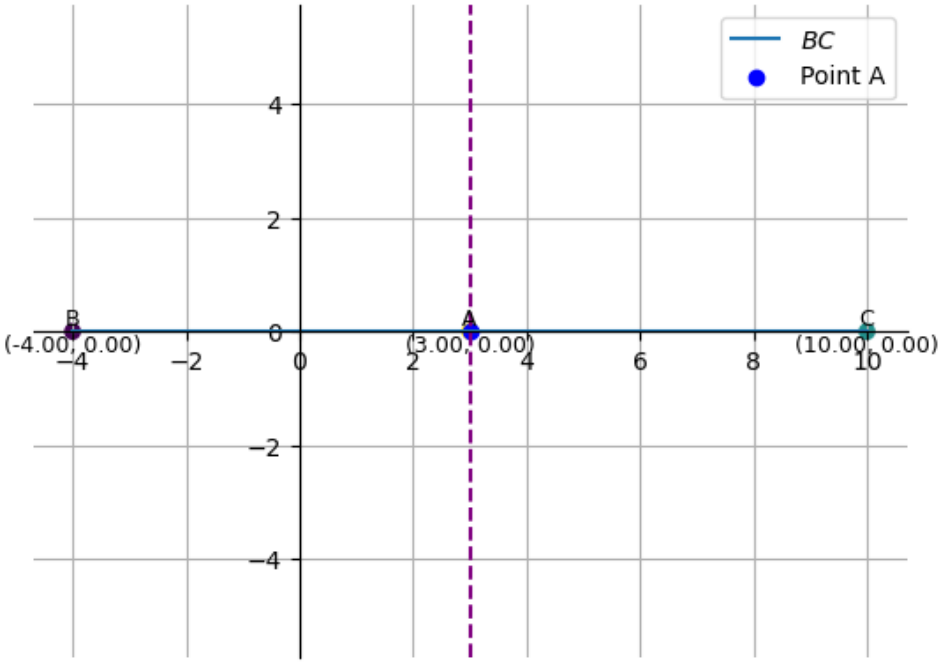

Fig. 0: Equidistant point A on X-Axis