1.4.1. The equation of the perpendicular bisector of BC is

$$\left(\mathbf{B}-\mathbf{C}\right)^{\top}\left(\mathbf{x}-\frac{\mathbf{B}+\mathbf{C}}{2}\right)=0 \tag{1}$$

Substitute numerical values and find the equations of the perpendicular bisectors of AB, BC and CA.
Solution: It is given that

$$\mathbf{A}=\begin{pmatrix}1\\-1\end{pmatrix},\mathbf{B}=\begin{pmatrix}-4\\6\end{pmatrix},\mathbf{C}=\begin{pmatrix}-3\\-5\end{pmatrix} \tag{2}$$

1. The equation of perpendicular bisector of BC is given as

$$\left(\mathbf{B}-\mathbf{C}\right)^{\top}\left(\mathbf{x}-\frac{\mathbf{B}+\mathbf{C}}{2}\right)=0 \tag{3}$$

$$\left(\begin{pmatrix}-4\\6\end{pmatrix}-\begin{pmatrix}-3\\-5\end{pmatrix}\right)^{\top}\left(\mathbf{x}-\frac{1}{2}\left(\begin{pmatrix}-4\\6\end{pmatrix}+\begin{pmatrix}-3\\-5\end{pmatrix}\right)\right)=0 \tag{4}$$

$$\begin{pmatrix}-1\\11\end{pmatrix}^{\top}\left(\mathbf{x}-\frac{1}{2}\begin{pmatrix}-7\\1\end{pmatrix}\right)=0 \tag{5}$$

$$\begin{pmatrix}-1 & 11\end{pmatrix}\left(\mathbf{x}-\frac{1}{2}\begin{pmatrix}-7\\1\end{pmatrix}\right)=0 \tag{6}$$

$$\begin{pmatrix}-1 & 11\end{pmatrix}\mathbf{x}=\frac{1}{2}\begin{pmatrix}-1 & 11\end{pmatrix}\begin{pmatrix}-7\\1\end{pmatrix} \tag{7}$$

$$\begin{pmatrix}-1 & 11\end{pmatrix}\mathbf{x}=\frac{7+11}{2} \tag{8}$$

$$\begin{pmatrix}-1 & 11\end{pmatrix}\mathbf{x}=9 \tag{9}$$

2. Similarly, the equation of the perpendicular bisector of AB is given as

$$\left(\mathbf{B}-\mathbf{A}\right)^{\top}\left(\mathbf{x}-\frac{\mathbf{B}+\mathbf{A}}{2}\right)=0 \tag{10}$$

$$\left(\begin{pmatrix}-4\\6\end{pmatrix}-\begin{pmatrix}1\\-1\end{pmatrix}\right)^{\top}\left(\mathbf{x}-\frac{1}{2}\left(\begin{pmatrix}-4\\6\end{pmatrix}+\begin{pmatrix}1\\-1\end{pmatrix}\right)\right)=0 \tag{11}$$

$$\begin{pmatrix}-5\\7\end{pmatrix}^{\top}\left(\mathbf{x}-\frac{1}{2}\begin{pmatrix}-3\\5\end{pmatrix}\right)=0 \tag{12}$$

$$\begin{pmatrix}-5 & 7\end{pmatrix}\left(\mathbf{x}-\frac{1}{2}\begin{pmatrix}-3\\5\end{pmatrix}\right)=0 \tag{13}$$

$$\begin{pmatrix}-5 & 7\end{pmatrix}\mathbf{x}=\frac{1}{2}\begin{pmatrix}-5 & 7\end{pmatrix}\begin{pmatrix}-3\\5\end{pmatrix} \tag{14}$$

$$\begin{pmatrix}-5 & 7\end{pmatrix}\mathbf{x}=\frac{15+35}{2} \tag{15}$$

$$\begin{pmatrix}-5 & 7\end{pmatrix}\mathbf{x}=25 \tag{16}$$

3. Similarly, the equation of the perpendicular bisector of AC is given as

$$\left(\mathbf{A}-\mathbf{C}\right)^\top\left(\mathbf{x}-\frac{\mathbf{A}+\mathbf{C}}{2}\right)=0 \tag{17}$$

$$\left(\begin{pmatrix}1\\-1\end{pmatrix}-\begin{pmatrix}-3\\-5\end{pmatrix}\right)^\top\left(\mathbf{x}-\frac{1}{2}\left(\begin{pmatrix}1\\-1\end{pmatrix}+\begin{pmatrix}-3\\-5\end{pmatrix}\right)\right)=0 \tag{18}$$

$$\begin{pmatrix}4\\4\end{pmatrix}^\top\left(\mathbf{x}-\frac{1}{2}\begin{pmatrix}-2\\-6\end{pmatrix}\right)=0 \tag{19}$$

$$\begin{pmatrix}4 & 4\end{pmatrix}\left(\mathbf{x}+\begin{pmatrix}1\\3\end{pmatrix}\right)=0 \tag{20}$$

$$\begin{pmatrix}4 & 4\end{pmatrix}\mathbf{x}=-\begin{pmatrix}4 & 4\end{pmatrix}\begin{pmatrix}1\\3\end{pmatrix} \tag{21}$$

$$\begin{pmatrix}4 & 4\end{pmatrix}\mathbf{x}=-4-12 \tag{22}$$

$$\begin{pmatrix}4 & 4\end{pmatrix}\mathbf{x}=-16 \tag{23}$$

$$4\begin{pmatrix}1 & 1\end{pmatrix}\mathbf{x}=-16 \tag{24}$$

$$\begin{pmatrix}1 & 1\end{pmatrix}\mathbf{x}=-4 \tag{25}$$

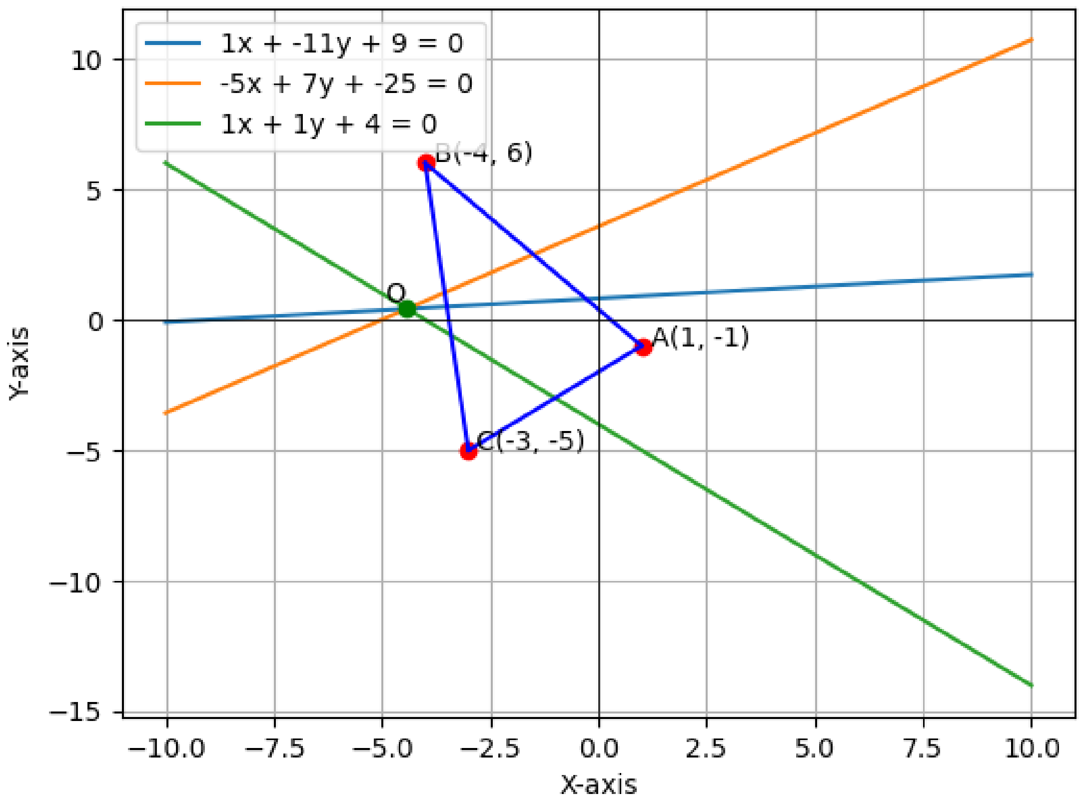

Figure 1: Perpendicular bisectors of AB, BC and CA