Question 1.3.2

Find the equation of AD_1

Solution: Since AD_1 is a altitude, the normal vector to it will be

$$\mathbf{n} = \mathbf{B} - \mathbf{C} \tag{1}$$

$$= \begin{pmatrix} -4 \\ 6 \end{pmatrix} - \begin{pmatrix} -3 \\ -5 \end{pmatrix} \tag{2}$$

$$= \begin{pmatrix} -1 \\ 11 \end{pmatrix} \tag{3}$$

The normal equation of AD_1 will be

$$\mathbf{n}^\top \mathbf{x} = \mathbf{n}^\top \mathbf{A} \tag{4}$$

$$\implies \begin{pmatrix} -1 & 11 \end{pmatrix} \mathbf{x} = \begin{pmatrix} -1 & 11 \end{pmatrix} \begin{pmatrix} 1 \\ -1 \end{pmatrix} \tag{5}$$

Hence, we get the line
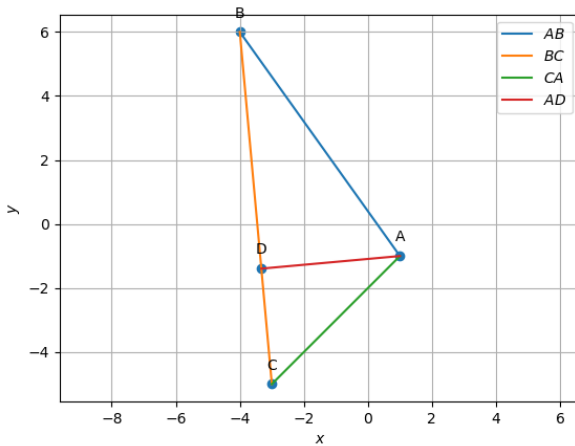
$$AD_1 : \begin{pmatrix} -1 & 11 \end{pmatrix} \mathbf{x} = -12 \tag{6}$$

Fig. 1. Angle bisectors plotted using python