Problem 1.1.5

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question:The area of $\triangle ABC$ is defined as
$\frac{1}{2}\|(\mathbf{A}-\mathbf{B})\times\mathbf{A}-\mathbf{C}\|$
where
$\mathbf{A}\times\mathbf{B} \overset{\Delta}{=} \begin{vmatrix} 1 & -4 \\ -1 & 6 \end{vmatrix}$ find the area of $\triangle ABC$.

Solution:

$$\mathbf{A}-\mathbf{B} = \begin{pmatrix} 5 \\ -7 \end{pmatrix} \tag{1}$$

$$\mathbf{A}-\mathbf{C} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \tag{2}$$

now we go further

$$\frac{1}{2}\|(\mathbf{A}-\mathbf{B})\times\mathbf{A}-\mathbf{C}\| = \frac{1}{2}\left\|\begin{pmatrix} 5 \\ -7 \end{pmatrix}\times\begin{pmatrix} 4 \\ 4 \end{pmatrix}\right\| \tag{3}$$

$$= \frac{1}{2}\left|\begin{vmatrix} 5 & 4 \\ -7 & 4 \end{vmatrix}\right| \tag{4}$$

$$= 24 \tag{5}$$

hence the area of $\triangle ABC$ is 24