1.9.31

EE25BTECH11043 - Nishid Khandagre

Question: $\mathbf{D} - \mathbf{A}$ is a median of triangle ABC with vertices $A \begin{pmatrix} 5 \\ -6 \end{pmatrix}$, $B \begin{pmatrix} 6 \\ 4 \end{pmatrix}$, and $C \begin{pmatrix} 0 \\ 0 \end{pmatrix}$. Find the length of $\mathbf{D} - \mathbf{A}$.

Solution: $\mathbf{A} = \begin{pmatrix} 5 \\ -6 \end{pmatrix} \mathbf{B} = \begin{pmatrix} 6 \\ 4 \end{pmatrix} \mathbf{C} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$

$\mathbf{D}$ is the midpoint of $\mathbf{C} - \mathbf{B}$.

$$\mathbf{D} = \frac{\mathbf{B} + \mathbf{C}}{2} \tag{0.1}$$

$$= \frac{1}{2}\left(\begin{pmatrix} 6 \\ 4 \end{pmatrix} + \begin{pmatrix} 0 \\ 0 \end{pmatrix} \right) \tag{0.2}$$

$$= \frac{1}{2} \begin{pmatrix} 6 \\ 4 \end{pmatrix} \tag{0.3}$$

$$= \begin{pmatrix} 3 \\ 2 \end{pmatrix} \tag{0.4}$$

$$\mathbf{D} - \mathbf{A} = \begin{pmatrix} 3 \\ 2 \end{pmatrix} - \begin{pmatrix} 5 \\ -6 \end{pmatrix} \tag{0.5}$$

$$= \begin{pmatrix} -2 \\ 8 \end{pmatrix} \tag{0.6}$$

Length of $\mathbf{D} - \mathbf{A}$ is $\|\mathbf{D} - \mathbf{A}\|$.

$$\|\mathbf{D} - \mathbf{A}\| = \sqrt{\left(\mathbf{D} - \mathbf{A}\right)^T \left(\mathbf{D} - \mathbf{A}\right)} \tag{0.7}$$

$$\|\mathbf{D} - \mathbf{A}\| = \sqrt{(-2)^2 + (8)^2} \tag{0.8}$$

$$= \sqrt{4 + 64} \tag{0.9}$$
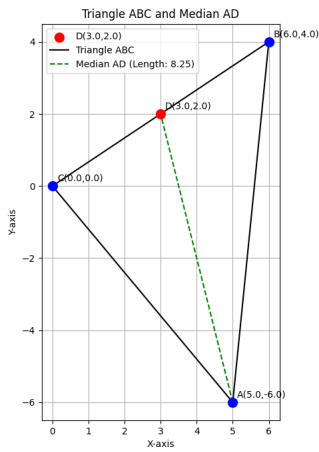
$$= \sqrt{68} \tag{0.10}$$

$$= 2\sqrt{17} \tag{0.11}$$

Fig. 0.1