

1.8.3

SAMYAK GONDANE - AI25BTECH11029

Question

Find the length of the median of the triangle with vertices **A**(0,0,6), **B**(0,4,0) and **C**(6,0,0).

Solution

- Midpoint of BC:

$$M_{BC} = \frac{1}{2}(\mathbf{B} + \mathbf{C}) = \begin{pmatrix} 5 \\ 0 \end{pmatrix} \quad (1)$$

- Midpoint of AC:

$$M_{AC} = \frac{1}{2}(\mathbf{A} + \mathbf{C}) = \begin{pmatrix} 3 \\ 3 \end{pmatrix} \quad (2)$$

- Midpoint of AB:

$$M_{AB} = \frac{1}{2}(\mathbf{A} + \mathbf{B}) = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \quad (3)$$

Solution

- Median from A:

$$\mathbf{AM} = M_{BC} - A = \begin{pmatrix} 5 \\ -6 \end{pmatrix} \quad (4)$$

- Median from B:

$$\mathbf{BM} = M_{AC} - B = \begin{pmatrix} -1 \\ 3 \end{pmatrix} \quad (5)$$

- Median from C:

$$\mathbf{CM} = M_{AB} - C = \begin{pmatrix} -4 \\ 3 \end{pmatrix} \quad (6)$$

Solution

Using Euclidean norm:

$$\|\mathbf{v}\| = \sqrt{x^2 + y^2} \quad (7)$$

•

$$\|\mathbf{AM}\| = \sqrt{5^2 + (-6)^2} = \sqrt{61} \quad (8)$$

•

$$\|\mathbf{BM}\| = \sqrt{(-1)^2 + 3^2} = \sqrt{10} \quad (9)$$

•

$$\|\mathbf{CM}\| = \sqrt{(-4)^2 + 3^2} = \sqrt{25} = 5 \quad (10)$$

3D Triangle and Medians

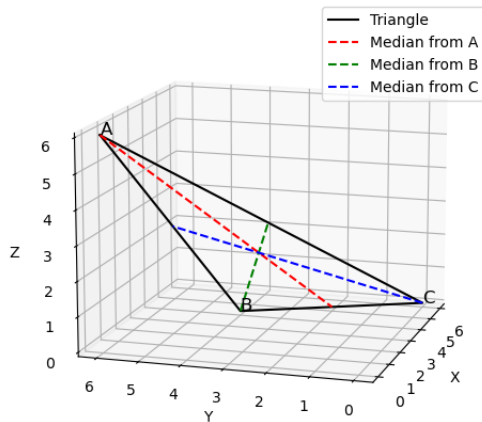


Figure:

Conclusion

The lengths of the medians are:

$$\|\mathbf{AM}\| = \sqrt{61}, \quad \|\mathbf{BM}\| = \sqrt{10}, \quad \|\mathbf{CM}\| = 5 \quad (11)$$