Assignment 7

V.Nagajyothi

Download all python codes from

https://github.com/nagajyothi/ASSIGNMENT7/Assignment7.py

and latex-tikz codes from

https://github.com/nagajyothi/ASSIGNMENT7/main.tex

1 Question No.VECTORS-2.7

Find the area of triangle having the points $\mathbf{A} = \begin{pmatrix}1\\1\\1\end{pmatrix}, \mathbf{B} = \begin{pmatrix}1\\2\\3\end{pmatrix}$,and $\mathbf{C} = \begin{pmatrix}2\\3\\1\end{pmatrix}$ as it's vertices

2 SOLUTION

The area of a triangle using the vector product is obtained as

$$\frac{1}{2}\left\|\left(\mathbf{B}-\mathbf{A}\right)\times\left(\mathbf{C}-\mathbf{A}\right)\right\| \tag{2.0.1}$$

$$\mathbf{B}-\mathbf{A} = \begin{pmatrix}1\\2\\3\end{pmatrix} - \begin{pmatrix}1\\1\\1\end{pmatrix} = \begin{pmatrix}0\\1\\2\end{pmatrix} \tag{2.0.2}$$

$$\mathbf{C}-\mathbf{A} = \begin{pmatrix}2\\3\\1\end{pmatrix} - \begin{pmatrix}1\\1\\1\end{pmatrix} = \begin{pmatrix}1\\2\\0\end{pmatrix} \tag{2.0.3}$$

$$\frac{1}{2}\left\|\left(\mathbf{B}-\mathbf{A}\right)\times\left(\mathbf{C}-\mathbf{A}\right)\right\| \tag{2.0.4}$$

$$\frac{1}{2}\left\|\begin{pmatrix}0\\1\\2\end{pmatrix}\times\begin{pmatrix}1\\2\\0\end{pmatrix}\right\| \tag{2.0.5}$$

$$= \mathbf{1} \tag{2.0.6}$$

For any two vectors,

$$\mathbf{a} = \begin{pmatrix}a_1\\a_2\\a_3\end{pmatrix} = \begin{pmatrix}0\\1\\2\end{pmatrix}, \mathbf{b}\begin{pmatrix}b_1\\b_2\\b_3\end{pmatrix} = \begin{pmatrix}1\\2\\0\end{pmatrix}, \tag{2.0.7}$$

$$\mathbf{a}\times\mathbf{b} = \begin{pmatrix}0 & -a_3 & a_2\\ a_3 & 0 & -a_1\\ -a_2 & a_1 & 0\end{pmatrix}\begin{pmatrix}b_1\\b_2\\b_3\end{pmatrix} \tag{2.0.8}$$

$$= \begin{pmatrix}0 & -2 & 1\\ 2 & 0 & -0\\ -1 & 0 & 0\end{pmatrix}\begin{pmatrix}1\\2\\0\end{pmatrix} \tag{2.0.9}$$

$$= \begin{pmatrix}-2\\4\\0\end{pmatrix} \tag{2.0.10}$$

PLOT OF GIVEN -

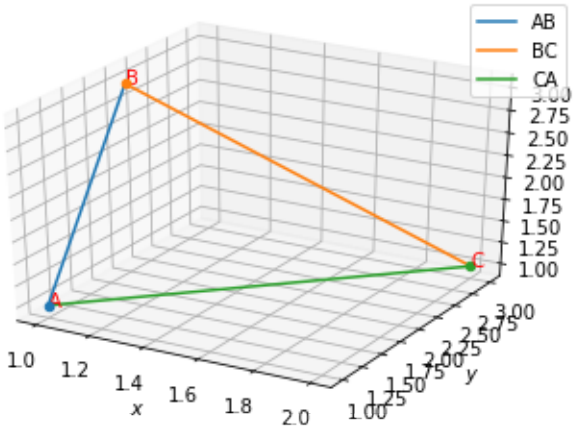

Fig. 0: the area of triangle