1.11.12

EE24BTECH11030 - J.KEDARANANDA

Question:
If the sum of 2 vectors is a unit vector , prove that the magnitude of their difference is $\sqrt{3}$. (12, 2018)

Solution:

Variable	Norm	Value
$\mathbf{A}$	$\|\|\mathbf{A}\|\|$	1
$\mathbf{B}$	$\|\|\mathbf{B}\|\|$	1
$\mathbf{A}+\mathbf{B}$	$(\|\|\mathbf{A}+\mathbf{B}\|\|)$	1

TABLE 0

$$\|\|\mathbf{A}\|\| = \|\|\mathbf{B}\|\| = 1 \tag{0.1}$$

$$\|\|\mathbf{A}+\mathbf{B}\|\| = 1 \tag{0.2}$$

$$\|\|\mathbf{A}+\mathbf{B}\|\|^2 = \|\|\mathbf{A}\|\|^2 + \|\|\mathbf{B}\|\|^2 + 2\,(\mathbf{A}\cdot\mathbf{B}) \tag{0.3}$$

$$1 = 2 + 2\,(\mathbf{A}\cdot\mathbf{B}) \tag{0.4}$$

$$(\mathbf{A}\cdot\mathbf{B}) = \frac{-1}{2} \tag{0.5}$$

$$\|\|\mathbf{A}-\mathbf{B}\|\|^2 = \|\|\mathbf{A}\|\|^2 + \|\|\mathbf{B}\|\|^2 - 2\,(\mathbf{A}\cdot\mathbf{B}) \tag{0.6}$$

$$\|\|\mathbf{A}-\mathbf{B}\|\|^2 = 1 + 1 + 1 \tag{0.7}$$

$$\|\|\mathbf{A}-\mathbf{B}\|\|^2 = 3 \tag{0.8}$$

$$\|\|\mathbf{A}-\mathbf{B}\|\| = \sqrt{3} \tag{0.9}$$

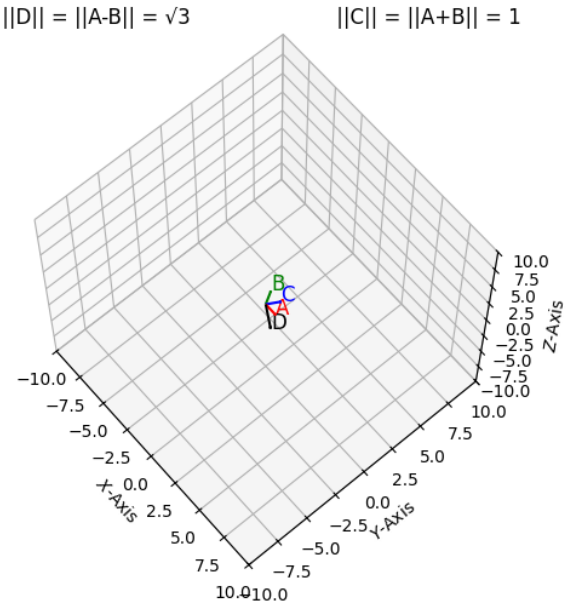

Fig. 0.1