

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
A	$\ \mathbf{A}\ $	1
B	$\ \mathbf{B}\ $	1
A + B	$(\ \mathbf{A} + \mathbf{B}\)$	1

TABLE 0

$$\|\mathbf{A}\| = \|\mathbf{B}\| = 1 \quad (0.1)$$

$$\|\mathbf{A} + \mathbf{B}\| = 1 \quad (0.2)$$

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

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

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

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

$$\|\mathbf{A} - \mathbf{B}\|^2 = 1 + 1 + 1 \quad (0.7)$$

$$\|\mathbf{A} - \mathbf{B}\|^2 = 3 \quad (0.8)$$

$$\|\mathbf{A} - \mathbf{B}\| = \sqrt{3} \quad (0.9)$$