

QUIZ 4

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1 PROBLEM 1

1. If, $\mathbf{a} \cdot \mathbf{a} = 0$ and $\mathbf{a} \cdot \mathbf{b} = 0$ then what can be concluded about the vector \mathbf{b} ?

SOLUTION:

$$\mathbf{a} \cdot \mathbf{a} = 0 \text{ (Given)} \quad (1.0.1)$$

$$\|\mathbf{a}\| \|\mathbf{a}\| \cos 0 = 0 \quad (1.0.2)$$

$$\|\mathbf{a}\|^2 \cos 0 = 0 \quad (1.0.3)$$

$$\|\mathbf{a}\|^2 \cdot 1 = 0 \quad (1.0.4)$$

$$\|\mathbf{a}\|^2 = 0 \quad (1.0.5)$$

$$\|\mathbf{a}\| = 0 \quad (1.0.6)$$

Therefore, it can be concluded that $\mathbf{a} = 0$

$$\mathbf{a} \cdot \mathbf{b} = 0 \text{ (Given)} \quad (1.0.7)$$

$$0 \cdot \|\mathbf{b}\| = 0 \quad (1.0.8)$$

which is true for any vector \mathbf{b}

$$\text{Since, } \mathbf{a} = 0 \quad (1.0.9)$$

$$\mathbf{b} = 0 \quad (1.0.10)$$

$$\mathbf{a} \cdot \mathbf{a} = 0 \quad (1.0.11)$$

$$\mathbf{a} \cdot \mathbf{b} = 0 \quad (1.0.12)$$

\mathbf{b} can be any vector.

$$\text{Let, } \mathbf{b} = \begin{pmatrix} 8 \\ -5 \\ 2 \end{pmatrix} \quad (1.0.13)$$

$$\mathbf{a} \cdot \mathbf{b} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \cdot \begin{pmatrix} 8 \\ -5 \\ 2 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \quad (1.0.14)$$