QUIZ 4

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1 PROBLEM 1

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

SOLUTION:

$$\mathbf{a}^\top \mathbf{a} = 0 (Given) \qquad (1.0.1)$$

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

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

$$(\|\mathbf{a}\|^2)^\top 1 = 0 \qquad (1.0.4)$$

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

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

$$\mathbf{a}^\top \mathbf{b} = 0 (Given) \qquad (1.0.6)$$

$$0 \|\mathbf{b}\| = 0 \qquad (1.0.7)$$

which is true for any vector $\mathbf{b}$ Since,

$$\mathbf{a} = 0 \qquad (1.0.8)$$

$$\mathbf{b} = 0 \qquad (1.0.9)$$

$$\mathbf{a}^\top \mathbf{a} = 0 \qquad (1.0.10)$$

$$\mathbf{a}^\top \mathbf{b} = 0 \qquad (1.0.11)$$

$\mathbf{b}$ can be any vector.

$$Let, \mathbf{b} = \begin{pmatrix} 8 \\ -5 \\ 2 \end{pmatrix} \qquad (1.0.12)$$

$$\mathbf{a}^\top \mathbf{b} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}^\top \begin{pmatrix} 8 \\ -5 \\ 2 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \qquad (1.0.13)$$