

Linear Algebra
Quiz 9

Name: _____

You have 10 minutes to complete this quiz. If you have a question raise your hand and remain seated. In order to receive full credit your answer must be **complete**, **legible** and **correct**. Show your work, and give adequate explanations.

1. Write the definition of a (*real*) *inner product* on a vector space V .

A (real) inner product on V is a positive definite, symmetric, bilinear form on V .

2. Find $\cos(\theta)$ where θ is the angle between the two long diagonals of a cube.

Vectors in the appropriate directions are $\mathbf{u} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix}$. By our formula, $\cos(\theta) = (\mathbf{u} \bullet \mathbf{v}) / \|\mathbf{u}\| \cdot \|\mathbf{v}\| = \frac{1}{3}$.

$((-\mathbf{u} \bullet \mathbf{v}) / \|\mathbf{u}\| \cdot \|\mathbf{v}\| = \frac{-1}{3})$ is also a valid answer.)