

Worksheet 17**Orthogonality & Inner Products**MATH 2250, Fall 2018

1. Find a unit vector in the direction of the given vectors

(a) $\mathbf{x} = \begin{bmatrix} -6 \\ 4 \\ -3 \end{bmatrix}$

(b) $\mathbf{w} = \begin{bmatrix} \frac{8}{3} \\ 2 \end{bmatrix}$

2. Determine which set of vectors are orthogonal.

$$(a) \quad \mathbf{u} = \begin{bmatrix} 12 \\ 3 \\ -5 \end{bmatrix}, \quad \mathbf{v} = \begin{bmatrix} 2 \\ -3 \\ 3 \end{bmatrix}$$

$$(b) \quad \mathbf{z} = \begin{bmatrix} -3 \\ 7 \\ 4 \\ 0 \end{bmatrix}, \quad \mathbf{w} = \begin{bmatrix} 1 \\ -8 \\ 15 \\ -7 \end{bmatrix}$$

3. Verify that $(\mathbf{u} + \mathbf{v}) \cdot \mathbf{w} = \mathbf{u} \cdot \mathbf{w} + \mathbf{v} \cdot \mathbf{w}$. (Hint: Use the definition of the inner product that involves the transpose)

4. Verify that $(c\mathbf{u}) \cdot \mathbf{v} = c(\mathbf{u} \cdot \mathbf{v}) = \mathbf{u} \cdot (c\mathbf{v})$. Use the same hint as in problem 3.