

# Homework 26 MATH 304 Section 3

**Assigned:** Wednesday, December 3.

**Potentially Collected:** Wednesday, December 10.

1. Let  $\vec{u} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$ ,  $\vec{v} = \begin{bmatrix} 4 \\ -5 \end{bmatrix}$ ,  $\vec{w} = \begin{bmatrix} -4 \\ -5 \end{bmatrix}$ ,  $\vec{a} = \begin{bmatrix} 0 \\ -2 \\ 0 \end{bmatrix}$ ,  $\vec{b} = \begin{bmatrix} -1 \\ -3 \\ -4 \end{bmatrix}$ , and  $\vec{c} = \begin{bmatrix} 1 \\ -2 \\ 4 \end{bmatrix}$ .

(a) Find  $\|\vec{a}\|$ ,  $\|\vec{b}\|$ , and  $\|\vec{c}\|$ .

(b) Find  $\|\vec{u} - \vec{v}\|$  and  $\|\vec{w} - \vec{v}\|$ .

(c) Find  $\text{proj}_{\vec{a}}(\vec{c})$  and  $\text{proj}_{\vec{b}}(\vec{c})$ .

(d) Find  $\text{proj}_{\vec{v}}(\vec{u})$  and  $\text{proj}_{\vec{v}}(\vec{w})$ .

(e) Find  $\vec{v} \cdot \vec{w}$  and  $\vec{a} \cdot \vec{b}$ .

2. Which of the following vectors are orthogonal? in the same direction? in opposing directions?

$$\vec{a} = \begin{bmatrix} 1 \\ -1 \\ -2 \end{bmatrix} \quad \vec{b} = \begin{bmatrix} 3 \\ -1 \\ 2 \end{bmatrix} \quad \vec{c} = \begin{bmatrix} 2 \\ 4 \\ -1 \end{bmatrix} \quad \vec{d} = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} \quad \vec{e} = \begin{bmatrix} \frac{-1}{2} \\ 0 \\ \frac{-1}{4} \end{bmatrix}$$

3. Let  $\vec{w} = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$  and  $\vec{x} = \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$ . Find all the vectors  $\vec{v}$  where  $\vec{v} \perp \vec{w}$  and  $\vec{v} \perp \vec{x}$ .