

MAT 137

HW #8

Name _____

04/23/09 (due Wednesday 04/29/09)

10 points

Show work or otherwise justify your answers. Unsupported answers (i.e. calculator output) will not receive full credit. You may check your answers with a calculator or computer.

1. Let $\mathbf{v} = 2\mathbf{i} - \mathbf{j}$ and $\mathbf{w} = \mathbf{i} + 3\mathbf{j}$.

(a) Find $3\mathbf{v} + \mathbf{w}$.

(b) Find the length $\|\mathbf{v}\|$ of the vector $\mathbf{v}$.

(c) Find a vector parallel to $\mathbf{v}$ whose length is equal to 2.

Hint: First find a unit vector parallel to $\mathbf{v}$, then multiply by 2.

(d) Compute the scalar (or dot) product $\mathbf{v} \cdot \mathbf{w}$.

(e) Use the scalar (or dot) product to find the cosine of the angle between $\mathbf{v}$ and $\mathbf{w}$.

(f) Which vector below is perpendicular to $\mathbf{w} = \mathbf{i} + 3\mathbf{j}$? Circle the correct answer.

Hint: Use dot product.

$$2\mathbf{i} + 3\mathbf{j}, \quad 5\mathbf{i} - 2\mathbf{j}, \quad -6\mathbf{i} + 2\mathbf{j}, \quad \mathbf{i} - 3\mathbf{j}$$

2. Find the scalar and vector projections of the vector $\mathbf{v} = \langle 5, 1, 2 \rangle$ onto the vector $\mathbf{w} = \langle 1, 1, 1 \rangle$.

3. (a) Find the vector (cross) product $\mathbf{v} \times \mathbf{w}$ of the vectors $\mathbf{v} = \langle 4, -2, 1 \rangle$ and $\mathbf{w} = \langle 1, 5, -2 \rangle$.

(b) Find the area of the parallelogram spanned by $\mathbf{v}$ and $\mathbf{w}$.

Hint: The area is equal to the magnitude of the cross product.

4. (a) Write an equation for the plane perpendicular to the vector $\langle 3, -2, 5 \rangle$ which passes through the point $(1, 1, 1)$.

(b) Write an equation for the plane through the origin which contains the two vectors $\langle 1, 0, 2 \rangle$ and $\langle 0, 1, -4 \rangle$.

Hint: Use cross product to find a normal vector.

5. Write vector and scalar parametric equations describing the line which is perpendicular to the plane $10x - y + 5z = 10$ and passes through the point $(3, 1, 1)$.