

# Math 233 - Assignment 2

January 30, 2024

Name \_\_\_\_\_

Score \_\_\_\_\_

Show all work to receive full credit. Supply explanations when necessary. This assignment is due February 6.

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1. Let  $\vec{v} = 7\hat{i} - 8\hat{j} + 3\hat{k}$  and  $\vec{w} = -5\hat{i} + 6\hat{k}$ . Find the measure of the angle between  $\vec{v}$  and  $\vec{w}$ . Write your final answer in degrees, rounded to the nearest thousandth.
2. Let  $\vec{v} = 2\hat{i} - \hat{j} + 2\hat{k}$  and  $\vec{u} = 4\hat{i} + 2\hat{j} + 6\hat{k}$ . Now let  $\vec{w} = \text{proj}_{\vec{v}} \vec{u}$  and  $\vec{x} = \vec{u} - \vec{w}$ . Compute  $\vec{w}$  and  $\vec{x}$  and show that they are orthogonal.
3. If  $\vec{u} \cdot \vec{v} = \vec{u} \cdot \vec{w}$ , must it be true that  $\vec{v} = \vec{w}$ ?
4. Suppose  $\vec{u}$  is orthogonal to both  $\vec{v}$  and  $\vec{w}$ . Prove that  $\vec{u}$  is orthogonal to  $5\vec{v} - 3\vec{w}$ .
5. Find the measure of the angle that  $\vec{u} = -8\hat{i} + 7\hat{j} + 2\hat{k}$  makes with the positive  $y$ -axis. Write your final answer in degrees, rounded to the nearest thousandth.
6. Find a unit vector that is orthogonal to both  $\vec{v} = 4\hat{i} + 3\hat{j} - \hat{k}$  and  $\vec{u} = \hat{i} - 2\hat{j} + 3\hat{k}$ .
7. Find the area of the  $\triangle ABC$ , where  $A(1, 2, 3)$ ,  $B(0, -9, -4)$ , and  $C(-5, 8, -3)$ .
8. Find parametric and symmetric equations for the line in space that passes through the points  $P(8, 9, -4)$  and  $Q(6, -2, -4)$ .
9. A line is described by the equations  $\frac{x+5}{3} = 2y - 4 = -\frac{z}{6}$ . Find a point on the line and a vector that is parallel to the line. Then write parametric equations for the line.