

MA 213 Worksheet #3

Section 12.3

1 Find $\mathbf{a} \cdot \mathbf{b}$ for the following descriptions of \mathbf{a} and \mathbf{b} .

12.3.7 $\mathbf{a} = 2\mathbf{i} + \mathbf{j}$, $\mathbf{b} = \mathbf{i} - \mathbf{j} + \mathbf{k}$

12.3.9 $|\mathbf{a}| = 7$, $|\mathbf{b}| = 4$ the angle between \mathbf{a} and \mathbf{b} is $\pi/6$

2 12.3.19 Find the angle between the vectors $\mathbf{a} = 4\mathbf{i} - 3\mathbf{j} + \mathbf{k}$ and $\mathbf{b} = 2\mathbf{i} - \mathbf{k}$.

3 12.3.23 Determine whether the vectors $\mathbf{u} = 9\mathbf{i} - 6\mathbf{j} + 3\mathbf{k}$ and $\mathbf{v} = -6\mathbf{i} + 4\mathbf{j} - 2\mathbf{k}$ are orthogonal, parallel, or neither.

4 12.3.25 Use vectors to decide whether the triangle with vertices $P(1, -3, -2)$, $Q(2, 0, -4)$, and $R(6, -2, -5)$ is right angled.

5 12.3.41 Find the scalar and vector projections of \mathbf{b} onto \mathbf{a} .

$$\mathbf{a} = \langle 4, 7, -4 \rangle, \quad \mathbf{b} = \langle 3, -1, 1 \rangle$$

6 12.3.49 Find the work done by a force $\mathbf{F} = 8\mathbf{i} - 6\mathbf{j} + 9\mathbf{k}$ that moves an object from the point $(0, 10, 8)$ to the point $(6, 12, 20)$ along a straight line. The distance is measured in meters and the force in newtons.

Additional Recommended Problems

7 12.3.25 Find a unit vector that is orthogonal to both $\mathbf{i} + \mathbf{j}$ and $\mathbf{i} + \mathbf{k}$.

8 12.3.30 Find the acute angle between the lines.

$$x + 2y = 7, \quad 5x - y = 2$$

9 12.3.31 Find the acute angles between the curves at their points of intersection.

$$y = x^2, \quad y = x^3$$

10 12.3.45 Show that the vector $\text{orth}_{\mathbf{a}} \mathbf{b} = \mathbf{b} - \text{proj}_{\mathbf{a}} \mathbf{b}$ is orthogonal to \mathbf{a} .