

Name: _____

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

a. $|\mathbf{a}| = 3$, $|\mathbf{b}| = \sqrt{6}$, the angle between \mathbf{a} and \mathbf{b} is 45° .

b. $\mathbf{a} = \langle -2, \frac{1}{3} \rangle$,
 $\mathbf{b} = \langle -5, 12 \rangle$

c. $\mathbf{a} = 3\mathbf{i} + 2\mathbf{j} - \mathbf{k}$,
 $\mathbf{b} = 4\mathbf{i} + 5\mathbf{k}$

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

3. Determine whether the given vectors are orthogonal, parallel, or neither.

a. $\mathbf{u} = \langle -3, 9, 6 \rangle$,
 $\mathbf{v} = \langle 4, -12, -8 \rangle$

b. $\mathbf{u} = \mathbf{i} - \mathbf{j} + 2\mathbf{k}$,
 $\mathbf{v} = 2\mathbf{i} - \mathbf{j} + \mathbf{k}$

c. $\mathbf{u} = \langle a, b, c \rangle$,
 $\mathbf{v} = \langle -b, a, 0 \rangle$

4. Find the angle between a diagonal of a cube and one of its edges.

5. A sled is pulled along a level path through snow by a rope. A 30-lb force acting at an angle of 40° above the horizontal moves the sled 80 feet. Find the work done by the force.
6. Find the work done by a force $\mathbf{F} = 2\mathbf{i} + 3\mathbf{j} - \mathbf{k}$ that moves an object from the point $(2, 3, 5)$ to the point $(-4, 5, 1)$ along a straight line. The distance is measured in meters and the force in newtons.
7. Find the scalar and vector projections of \mathbf{b} onto \mathbf{a} .
- a. $\mathbf{a} = \langle 1, 2 \rangle$, $\mathbf{b} = \langle -4, 1 \rangle$ b. $\mathbf{a} = \mathbf{i} + \mathbf{j} + \mathbf{k}$, $\mathbf{b} = \mathbf{i} - \mathbf{j} + \mathbf{k}$
8. Given vectors $\mathbf{a} = \langle -3, 2 \rangle$ and $\mathbf{b} = \langle 2, 5 \rangle$, set up an ortho-normal base using \mathbf{a} and $\text{orth}_{\mathbf{a}}\mathbf{b}$ and then describe \mathbf{b} in terms of this base.