# 3-1 In-Class Exercise

**1.** Let $\mathbf{u} = (1, 2, -3, 5, 0)$, $\mathbf{v} = (0, 4, -1, 1, 2)$, and $\mathbf{w} = (7, 1, -4, -2, 3)$. Find the components of

$$\frac{1}{2}(\mathbf{w} - 5\mathbf{v} + 2\mathbf{u}) + \mathbf{v}$$

# 3-1 Suggested Exercise

**1.** Which of the following vectors in $R^6$, if any, are parallel to $\mathbf{u} = (-2, 1, 0, 3, 5, 1)$?

**a.** $(4, 2, 0, 6, 10, 2)$

**b.** $(4, -2, 0, -6, -10, -2)$

**c.** $(0, 0, 0, 0, 0, 0)$

**2.** Show that there do not exist scalars $c_1$, $c_2$, and $c_3$ such that

$$c_1(-2, 9, 6) + c_2(-3, 2, 1) + c_3(1, 7, 5) = (0, 5, 4)$$

**3.** Let $P$ be the point $(2, 3, -2)$ and $Q$ the point $(7, -4, 1)$. Find the midpoint of the line segment connecting the points $P$ and $Q$.

# 3.2 In-Class Exercise

**1.** Determine whether the expression makes sense mathematically.

a. $\|\mathbf{u}\| \cdot \|\mathbf{v}\|$

b. $(\mathbf{u} \cdot \mathbf{v}) - \mathbf{w}$

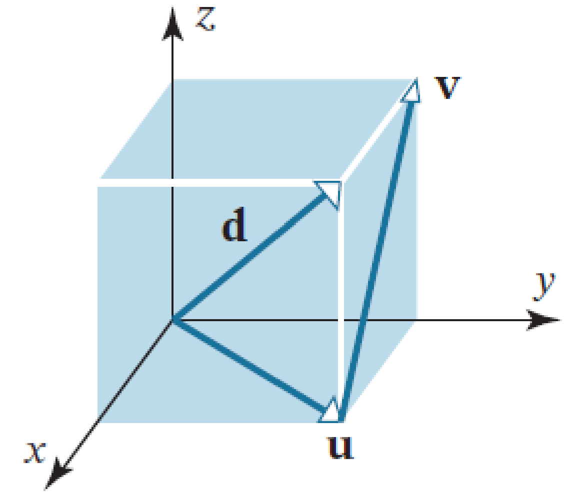
c. $(\mathbf{u} \cdot \mathbf{v}) - k$

d. $k \cdot \mathbf{u}$

# 3.2 Suggested Exercise

**1.** Let $\mathbf{v} = (1, 1, 2, -3, 1)$. Find all scalars $k$ such that $\|k\mathbf{v}\| = 4$.

**2.** Figure shows a cube. Find the angle between the vectors **d** and **u** to the nearest degree.



# 3.3 In-Class Exercise

**1.** Find the vector component of **u** along **a** and the vector component of **u** orthogonal to **a**.

$$\mathbf{u} = (-1, -2),\ \mathbf{a} = (-2, 3)$$

# 3.3 Suggested Exercise

**1.** Show that if $\mathbf{v}$ is orthogonal to both $\mathbf{w}_1$ and $\mathbf{w}_2$, then $\mathbf{v}$ is orthogonal to $k_1\mathbf{w}_1 + k_2\mathbf{w}_2$ for all scalars $k_1$ and $k_2$.

**2.** Is it possible to have $\operatorname{proj}_{\mathbf{a}}\mathbf{u} = \operatorname{proj}_{\mathbf{u}}\mathbf{a}$? Explain.

# 3.5 In-Class Exercise

**1.** Calculate the scalar triple product $\mathbf{u} \cdot (\mathbf{v} \times \mathbf{w})$ of the vectors

$$\mathbf{u} = 3\mathbf{i} - 2\mathbf{j} - 5\mathbf{k}, \quad \mathbf{v} = \mathbf{i} + 4\mathbf{j} - 4\mathbf{k}, \quad \mathbf{w} = 3\mathbf{j} + 2\mathbf{k}$$

# 3.5 Suggested Exercise

**1.** Find the area of the triangle in 3-space that has the given vertices.

$$P_1(2, 6, -1),\ \ P_2(1, 1, 1),\ \ P_3(4, 6, 2)$$

**2.** Simplify $(\mathbf{u} + \mathbf{v}) \times (\mathbf{u} - \mathbf{v})$.

**3.** Suppose that $\mathbf{u} \cdot (\mathbf{v} \times \mathbf{w}) = 3$. Find

a) $\mathbf{u} \cdot (\mathbf{w} \times \mathbf{v})$
b) $(\mathbf{v} \times \mathbf{w}) \cdot \mathbf{u}$
c) $\mathbf{w} \cdot (\mathbf{u} \times \mathbf{v})$