

## 14.5: Problems

### ? Problem 14.5.1

Given the following vectors in 3D:

$$\mathbf{v}_1 = \hat{\mathbf{i}} - 2\hat{\mathbf{j}} + \hat{\mathbf{k}}$$

$$\mathbf{v}_2 = \frac{1}{2}\hat{\mathbf{i}} - \frac{1}{2}\hat{\mathbf{k}}$$

$$\mathbf{v}_3 = \hat{\mathbf{i}} + \hat{\mathbf{j}} + \hat{\mathbf{k}}$$

$$\mathbf{v}_4 = -\hat{\mathbf{i}} + \hat{\mathbf{j}} + \hat{\mathbf{k}}$$

Calculate:

1.  $\mathbf{v}_1 - 3\mathbf{v}_2$
2.  $\mathbf{v}_3 + \frac{1}{2}\mathbf{v}_4$
3.  $\mathbf{v}_1 \cdot \mathbf{v}_2$
4.  $\mathbf{v}_3 \cdot \mathbf{v}_4$
5.  $\mathbf{v}_1 \cdot \mathbf{v}_3$
6.  $\mathbf{v}_1 \times \mathbf{v}_2$
7.  $|\mathbf{v}_1|$
8.  $|\mathbf{v}_2|$
9.  $|\mathbf{v}_3|$
10.  $|\mathbf{v}_4|$
11.  $\hat{\mathbf{v}}_2$
12.  $\hat{\mathbf{v}}_4$

What is the angle between  $\mathbf{v}_1$  and  $\mathbf{v}_2$ ?

Are  $\mathbf{v}_3$  and  $\mathbf{v}_4$  orthogonal?

Write a vector orthogonal to both  $\mathbf{v}_1$  and  $\mathbf{v}_2$ .

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