Exercise 8

In Exercises 6 to 11, compute $\|\mathbf{u}\|$, $\|\mathbf{v}\|$, and $\mathbf{u} \cdot \mathbf{v}$ for the given vectors in $\mathbb{R}^3$.

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

Solution

$$\|\mathbf{u}\| = \sqrt{5^2 + (-1)^2 + 2^2} = \sqrt{30} \approx 5.48$$

$$\|\mathbf{v}\| = \sqrt{1^2 + 1^2 + (-1)^2} = \sqrt{3} \approx 1.73$$

$$\mathbf{u} \cdot \mathbf{v} = (5\mathbf{i} - \mathbf{j} + 2\mathbf{k}) \cdot (\mathbf{i} + \mathbf{j} - \mathbf{k}) = (5)(1) + (-1)(1) + (2)(-1) = 2$$