

Exercise 4

Compute $\mathbf{u} \cdot \mathbf{v}$, where $\mathbf{u} = \sqrt{3}\mathbf{i} - 315\mathbf{j} + 22\mathbf{k}$ and $\mathbf{v} = \mathbf{u}/\|\mathbf{u}\|$.

Solution

$$\begin{aligned}\mathbf{u} \cdot \mathbf{v} &= \mathbf{u} \cdot \frac{\mathbf{u}}{\|\mathbf{u}\|} \\ &= \frac{1}{\|\mathbf{u}\|} (\mathbf{u} \cdot \mathbf{u}) \\ &= \frac{1}{\|\mathbf{u}\|} \|\mathbf{u}\|^2 \\ &= \|\mathbf{u}\| \\ &= \sqrt{(\sqrt{3})^2 + (-315)^2 + (22)^2} \\ &= \sqrt{99\,712} \\ &\approx 315.772\end{aligned}$$