Question

Given $\mathbf{u} = (4, 2, 0)$, $\mathbf{v} = (-3, 1, 1)$, $\mathbf{w} = (5, 1, 5)$, $\mathbf{s} = (1, 2, 1)$ find: (a) $\mathbf{u} \cdot \mathbf{v}$, (b) $(\mathbf{u} \cdot \mathbf{s})\hat{\mathbf{v}}$

Answer

$$\mathbf{u} = (4, 2, 0) \quad \mathbf{v} = (-3, 1, 1) \quad \mathbf{w} = (5, 1, 5) \quad \mathbf{s} = (1, 2, 1)$$

(a) $\mathbf{u} \cdot \mathbf{v} = 4 \times -3 + 2 \times 1 + 0 \times 1 = -12 + 2 = -10$

(b)

$$
\begin{aligned}
(\mathbf{u} \cdot \mathbf{s})\hat{\mathbf{v}} &= [4 \times 1 + 2 \times 2 + 0 \times 1] \times \frac{(-3, 1, 1)}{\sqrt{(-3)^2 + 1^2 + 1^2}} \\
&= \frac{8}{\sqrt{11}}(-3, 1, 1) \\
&= \left(\frac{-24}{\sqrt{11}}, \frac{8}{\sqrt{11}}, \frac{8}{\sqrt{11}} \right)
\end{aligned}
$$