

1.64(a)

1 1.64(a), §1 Asked

Given: The vectors

$$\vec{v} = (1, 2, 3) \quad \vec{w} = (1, -1, 2)$$

Asked: A unit vector \vec{u} normal to these two.

2 1.64(a), §2 Solution

$$\vec{v} = (1, 2, 3) \quad \vec{w} = (1, -1, 2)$$

If we cross \vec{v} and \vec{w} , we get a vector normal to them. If we divide that cross product by its length it will become a unit vector:

$$\vec{v} \times \vec{w} \equiv \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 2 & 3 \\ 1 & -1 & 2 \end{vmatrix} = \hat{i}(2 \cdot 2 - 3 \cdot (-1)) + \hat{j}(3 \cdot 1 - 1 \cdot 2) + \hat{k}(1 \cdot (-1) - 2 \cdot 1) = (7, 1, -3)$$

$$\vec{u} = \frac{\vec{v} \times \vec{w}}{\|\vec{v} \times \vec{w}\|} = \frac{(7, 1, -3)}{\sqrt{7^2 + 1^2 + (-3)^2}} = (7/\sqrt{59}, 1/\sqrt{59}, -3/\sqrt{59})$$