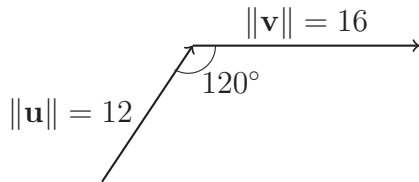


Name: _____

1. Given \mathbf{u} and \mathbf{v} as shown, find $|\mathbf{u} \times \mathbf{v}|$ and determine whether $\mathbf{u} \times \mathbf{v}$ is directed into the page or out of the page.



2. Find the cross product $\mathbf{a} \times \mathbf{b}$.

(a) $\mathbf{a} = \langle 1, 1, -1 \rangle$, $\mathbf{b} = \langle 2, 4, 6 \rangle$

(b) $\mathbf{a} = \mathbf{j} + 7\mathbf{k}$, $\mathbf{b} = 2\mathbf{i} - \mathbf{j} + 4\mathbf{k}$

3. Find two unit vectors orthogonal to both $\mathbf{i} + \mathbf{j} + \mathbf{k}$ and $2\mathbf{i} + \mathbf{k}$.

4. Find the area of the triangle with vertices $P = (1, 4, 6)$, $Q = (-2, 5, -1)$, and $R = (1, -1, 1)$.

5. A wrench 18 cm long lies along the negative x -axis and grips a bolt at the origin. A force is applied in the direction $\langle 3, 0, -5 \rangle$ at the end of the wrench. Find the magnitude of the force needed to supply 100 N·m of torque to the bolt.

6. Find the volume of the parallelepiped determined by the vectors $\mathbf{a} = \langle 1, 1, -1 \rangle$, $\mathbf{b} = \langle 1, -1, 1 \rangle$, and $\mathbf{c} = \langle -1, 1, 1 \rangle$.

7. Do the points $P = (3, 0, 1)$, $Q = (-1, 2, 5)$, $R = (5, 1, -1)$, and $S = (0, 4, 2)$ lie in the same plane?

8. Prove that $\mathbf{a} \times (\mathbf{b} \times \mathbf{c}) = (\mathbf{a} \cdot \mathbf{c})\mathbf{b} - (\mathbf{a} \cdot \mathbf{b})\mathbf{c}$