MATH 2E Prep: Products of Vectors

Facts to Know:

1. Dot product:

   - If $\vec{u} = \langle x_1, y_1, z_1 \rangle$, $\vec{v} = \langle x_2, y_2, z_2 \rangle$, then $\vec{u} \cdot \vec{v} =$

   - $\vec{u} \cdot \vec{v}$ is a scalar / vector.

   - $\vec{u} \cdot \vec{v} =$

   - $\vec{u} \perp \vec{v}$ if and only if _____.

2. Cross product:

   - If $\vec{u} = x_1 \mathbf{i} + y_1 \mathbf{j} + z_1 \mathbf{k}$, $\vec{v} = x_2 \mathbf{i} + y_2 \mathbf{j} + z_2 \mathbf{k}$, then $\vec{u} \times \vec{v} =$

   - $\vec{u} \times \vec{v}$ is a scalar / vector.

   - $|\vec{u} \times \vec{v}| =$

   - $\vec{u} \times \vec{v}$ is _____ to both $\vec{u}$ and $\vec{v}$.

   - The right-hand rule.

   - $\vec{u} \mathbin{/\mkern-5mu/} \vec{v}$ if and only if _____.

Examples:

1. Determine whether $\vec{u} = \langle 3, 5, 4 \rangle$ is perpendicular to $\vec{v} = \langle 1, -2, 2 \rangle$.

2. $\vec{u} = \langle 3, 5, 4 \rangle$, $\vec{v} = \langle 1, -2, 2 \rangle$, compute $\vec{u} \times \vec{v}$ and $\vec{v} \times \vec{u}$.

3. Use the following figure to find $\left| \vec{a} \times \vec{b} \right|$, and determine whether $\vec{a} \times \vec{b}$ is directed into the page or out of the page.

$|\vec{a}| = 5$

$45°$

$|\vec{b}| = 4$