EXERCISES #4

CROSS PRODUCT

Exercise 1. Find $\vec{u} \times \vec{v}$:

(1) $\vec{u} = \langle 0, 5, -4 \rangle$, $\vec{v} = \langle 1, 2, -1 \rangle$
(2) $\vec{u} = \langle 5, 6, 2 \rangle$, $\vec{v} = \langle 0, -4, -3 \rangle$
(3) $\vec{u} = \langle -1, -5, -3 \rangle$, $\vec{v} = \langle 4, -1, -3 \rangle$
(4) $\vec{u} = \langle 100, 200, 300 \rangle$, $\vec{v} = \langle -1, -2, -3 \rangle$

Exercise 2. True or False:

(1) If $\vec{u} \times \vec{v} = \vec{0}$, then $\vec{u}$ and $\vec{v}$ are parallel to each other.
(2) $\vec{u} \cdot (\vec{u} \times \vec{v}) = 0$.
(3) If $\vec{u} \times \vec{v} = \vec{0}$ and $\vec{u} \times \vec{w} = \vec{0}$, then $\vec{v} \times \vec{w} = \vec{0}$.
(4) If $\vec{u} \cdot (\vec{v} \times \vec{w}) = 0$, then $\vec{u}$ is either parallel to $\vec{v}$ or parallel to $\vec{w}$.

Exercise 3. Show that $|\vec{u} \times \vec{v}|^2 + |\vec{u} \cdot \vec{v}|^2 = |\vec{u}|^2 |\vec{v}|^2$.

Exercise 4. Explain why $|\vec{u} \times \vec{v}|$ is the area of the parallelogram formed by $\vec{u}$ and $\vec{v}$.

Exercise 5. Compute the volume of the parallelepiped formed by $\vec{u} = \langle 2, -5, 0 \rangle$, $\vec{v} = \langle -3, 0, 0 \rangle$, $\vec{w} = \langle 0, 1, 4 \rangle$.