

Quiz 2

Name: _____

No partial credit.
Write legible.

1. [5 points] Let \vec{a} , \vec{b} and \vec{c} be given non-zero vectors in \mathbb{R}^3 . Use dot and cross products to give expressions for vectors satisfying the following geometric descriptions:

(a) A vector orthogonal to \vec{a} and \vec{b} .

$$\underline{\vec{a} \times \vec{b}}$$

(b) A vector of length 2 orthogonal to \vec{a} and \vec{b} .

$$2 \frac{\vec{a} \times \vec{b}}{\|\vec{a} \times \vec{b}\|}$$

(c) The vector projection of \vec{b} onto \vec{a} .

$$\frac{\vec{a} \cdot \vec{b}}{\|\vec{a}\|^2} \vec{a}$$

(d) A vector with the length of \vec{b} and the direction of \vec{a} .

$$\frac{\vec{a}}{\|\vec{a}\|} \cdot \|\vec{b}\|$$

(e) A vector orthogonal to \vec{a} and $\vec{b} \times \vec{c}$

$$\underline{\vec{a} \times (\vec{b} \times \vec{c})}$$

2. [5 points] Let \vec{a} , \vec{b} , \vec{c} and \vec{d} be given non-zero vectors in \mathbb{R}^3 . Indicate which of the following expressions are vectors (V), scalars (S), and which are nonsense (N).

(a) $\vec{a} \times \vec{b} \times \vec{c}$ V $(\vec{a} \times \vec{b})$ is a vector and $(\vec{a} \times \vec{b}) \times \vec{c}$ is a vector(b) $(\vec{a} \cdot \vec{b}) \circ \vec{c}$ N $(\vec{a} \cdot \vec{b})$ is a scalar, \circ is defined for two vectors in the same dimension only(c) $(\vec{a} \times \vec{b}) \circ \vec{c}$ S $(\vec{a} \times \vec{b})$ is a vector $\Rightarrow (\vec{a} \times \vec{b}) \cdot \vec{c}$ is a scalar(d) $(\vec{a} \times \vec{b}) \circ (\vec{c} \times \vec{d})$ S $(\vec{a} \times \vec{b})$, $(\vec{c} \times \vec{d})$ are vectors $\Rightarrow (\vec{a} \times \vec{b}) \cdot (\vec{c} \times \vec{d})$ is a scalar(e) $(\vec{a} \cdot \vec{b}) \vec{c} - (\vec{a} \times \vec{b})$ V $(\vec{a} \cdot \vec{b})$ is a scalar, $(\vec{a} \cdot \vec{b}) \vec{c}$ is a vector, $\vec{a} \times \vec{b}$ is a vector $\Rightarrow (\vec{a} \cdot \vec{b}) \vec{c} - (\vec{a} \times \vec{b})$ is a vector