

Closed book. No calculators are to be used for this quiz.
Quiz duration: 15 minutes

Name:

Student ID:

Signature:

1. [30pts] Which of the following expressions involving vectors are mathematically legitimate? Mark only. No calculation is required.

(a) $\frac{\vec{A} \times \vec{B}}{\vec{A} \cdot \vec{B}}$

b) $\vec{A} \times (\vec{B} \cdot \vec{C})$

(c) $(\vec{B} \times \vec{C}) \cdot \vec{A}$

2. [70 pts] Given two vectors $\vec{A} = \hat{i} - 3\hat{j}$, $\vec{B} = -4\hat{i} + \hat{k}$. Calculate $(\vec{A} - \vec{B}) \times (\vec{A} + \vec{B})$.

$$\vec{A} - \vec{B} = 5\hat{i} - 3\hat{j} - \hat{k}$$

$$\vec{A} + \vec{B} = -3\hat{i} - 3\hat{j} + \hat{k}$$

$$(\vec{A} - \vec{B}) \times (\vec{A} + \vec{B}) = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 5 & -3 & -1 \\ -3 & -3 & 1 \end{vmatrix} = \hat{i}(-3-3) - \hat{j}(5-3) + \hat{k}(-15-9)$$

$$\boxed{(\vec{A} - \vec{B}) \times (\vec{A} + \vec{B}) = -6\hat{i} - 2\hat{j} - 24\hat{k}}$$

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1. [30pts] Which of the following expressions involving vectors are mathematically legitimate? Mark only. No calculation is required.

(a) $\frac{|\vec{A} \times \vec{B}|}{\vec{A} \cdot \vec{B}}$,

(b) $\vec{A} \cdot (\vec{A} \times \vec{B})$.

(c) $\vec{A} \cdot (\vec{A} \cdot \vec{B})$

2. [70 pts] Given two vectors $\vec{A} = \hat{i} - 3\hat{j}$, $\vec{B} = -4\hat{i} + \hat{j}$. Calculate $(\vec{A} \times \vec{B}) \times \vec{B}$.

$$(\vec{A} \times \vec{B}) = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -3 & 0 \\ -4 & 1 & 0 \end{vmatrix} = \hat{k}(1 - 12) = -11\hat{k}$$

$$(\vec{A} \times \vec{B}) \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & -11 \\ -4 & 1 & 0 \end{vmatrix} = \hat{i}(11) - \hat{j}(-44) + \hat{k}(0)$$

$$(\vec{A} \times \vec{B}) \times \vec{B} = 11\hat{i} + 44\hat{j}$$

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1. [30pts] Which of the following expressions involving vectors are mathematically legitimate? Mark only. No calculation is required.

(a) $(\vec{B} \times \vec{A}) \cdot \vec{C}$, b) $\vec{A} \times (\vec{B} - \vec{A} \cdot \vec{B})$ (c) $\sqrt{(\vec{A} - \vec{B}) \cdot (\vec{A} + \vec{B})}$

2. [70 pts] Given two vectors $\vec{A} = \hat{i} - 3\hat{j}$, $\vec{B} = -4\hat{i} + \hat{j}$. Calculate $\frac{(\vec{A} \times \vec{B})}{\vec{A} \cdot \vec{B}}$

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -3 & 0 \\ -4 & 1 & 0 \end{vmatrix} = -11\hat{k}$$

$$\vec{A} \cdot \vec{B} = -4 - 3 = -7$$

$$\frac{\vec{A} \times \vec{B}}{\vec{A} \cdot \vec{B}} = \frac{-11\hat{k}}{-7} = \frac{11}{7}\hat{k}$$

Section

Quiz 1-4

October 2016

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Name:

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1. [30pts] Which of the following expressions involving vectors are mathematically legitimate? Mark only. No calculation required.

a) $\frac{\vec{A}+\vec{B}}{\vec{A}\times\vec{B}}$, (b) $\vec{A} + (\vec{A}\cdot\vec{B})\vec{B}$, (c) $\sqrt{(\vec{C}\times\vec{B})\cdot\vec{A}}$

2. [70 pts] Given two vectors $\vec{A} = \hat{i} - 3\hat{j}$, $\vec{B} = -4\hat{i} + \hat{j}$. Calculate $(\vec{B} \times \vec{A}) \times \vec{A}$

$$\vec{B} \times \vec{A} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -4 & 1 & 0 \\ 1 & -3 & 0 \end{vmatrix} = \hat{k}(12-1) = 11\hat{k}$$

$$(\vec{B} \times \vec{A}) \times \vec{A} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & 11 \\ 1 & -3 & 0 \end{vmatrix} = \hat{i}(33) - \hat{j}(-11) + \hat{k}(0)$$

$$\boxed{(\vec{B} \times \vec{A}) \times \vec{A} = 33\hat{i} + 11\hat{j}}$$