

MATH 213 – QUIZ 1 – 2 FEBRUARY 2006

Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. (1 pt. each) Let $\mathbf{a}$, $\mathbf{b}$ and $\mathbf{c}$ be vectors. Indicate whether each of the following quantities is a vector or a scalar (circle one).

$\mathbf{a} \cdot \mathbf{b}$	SCALAR	VECTOR
$\text{proj}_{\mathbf{b}}(\mathbf{a})$	SCALAR	VECTOR
$\mathbf{a} \times \mathbf{b}$	SCALAR	VECTOR
$ (\mathbf{a} \times \mathbf{b}) \cdot \mathbf{c} $	SCALAR	VECTOR

2. Let $\mathbf{a} = 5\mathbf{i} + 3\mathbf{j} - 2\mathbf{k}$ and $\mathbf{b} = 6\mathbf{i} + 2\mathbf{k}$.

(a) (2 pts.) Find $|\mathbf{a}|$, $|\mathbf{b}|$.

$$|\vec{a}| = (25 + 9 + 4)^{1/2} = \sqrt{38} //$$

$$|\vec{b}| = (36 + 4)^{1/2} = \sqrt{40} = 2\sqrt{10} //$$

(b) (2 pts.) Find $\mathbf{a} \times \mathbf{b}$

$$\vec{a} \times \vec{b} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 5 & 3 & -2 \\ 6 & 0 & 2 \end{vmatrix} = 6\vec{i} - 22\vec{j} - 18\vec{k} //$$

(c) (2 pts.) Find the vector projection of $\mathbf{b}$ onto (or along) $\mathbf{a}$.

$$\begin{aligned} \text{proj}_{\vec{a}}(\vec{b}) &= \left(\frac{\vec{b} \cdot \vec{a}}{|\vec{a}|^2} \right) \vec{a} = \left(\frac{30 + 0 - 4}{38} \right) (5\vec{i} + 3\vec{j} - 2\vec{k}) \\ &= \frac{13}{19} (5\vec{i} + 3\vec{j} - 2\vec{k}) // \end{aligned}$$