Quiz 1 Calculus 3 8/31/2010

Each problem is worth 5 points. Clear and complete justification is required for full credit.

1. Suppose $\mathbf{a} = 5\mathbf{i} - 4\mathbf{k}$ and $\mathbf{b} = 4\mathbf{i} - \mathbf{j} + 2\mathbf{k}$. Find $\mathbf{a} + \mathbf{b}$ and $3\mathbf{a} - \mathbf{b}$.

$\vec{a} + \vec{b} = (5\hat{i} + 0\hat{j} - 4\hat{k}) + (4\hat{i} - 1\hat{j} + 2\hat{k})$

$\vec{a} + \vec{b} = 9\hat{i} - \hat{j} - 2\hat{k}$

$3\vec{a} - \vec{b} = 3(5\hat{i} - 4\hat{k}) - (4\hat{i} - \hat{j} + 2\hat{k})$

$= (15\hat{i} - 12\hat{k}) - (4\hat{i} - \hat{j} + 2\hat{k})$

$3\vec{a} - \vec{b} = 11\hat{i} + \hat{j} - 14\hat{k}$

Great!

2. Find a unit vector in the direction of $\mathbf{v} = \langle 2, -1, 2 \rangle$.

$\vec{v} = \langle 2, -1, 2 \rangle$ or $2\hat{i} - 1\hat{j} + 2\hat{k}$

unit vector in direction of $\vec{v} = \dfrac{\vec{v}}{|\vec{v}|} = \dfrac{2\hat{i} - 1\hat{j} + 2\hat{k}}{\sqrt{2^2 + (-1)^2 + 2^2}} = \dfrac{2}{3}\hat{i} - \dfrac{1}{3}\hat{j} + \dfrac{2}{3}\hat{k}$

$\sqrt{4 + 1 + 4} = \sqrt{9} = 3$

Excellent!