Quiz 1 Calculus 3 9/11/2006

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

Use the vectors $\vec{u} = 3\vec{i} + 2\vec{j} - \vec{k}$ and $\vec{v} = -2\vec{i} + \vec{j} + 2\vec{k}$ for the following problems:

1. Find $\|\vec{u}\|$. $|a| = \sqrt{a_1^2 + a_2^2 + a_3^2}$

$|\vec{u}| = \sqrt{\underset{9}{3^2} + \underset{4}{2^2} + \underset{1}{(-1)^2}}$

$|\vec{u}| = \underline{\sqrt{14}}$

Yes

2. Find a unit vector in the direction of $\vec{v}$. unit vector $= \frac{v}{|v|}$

$\frac{\vec{v}}{|\vec{v}|} = \frac{\langle -2, 1, 2 \rangle}{3} = \langle -\frac{2}{3}, \frac{1}{3}, \frac{2}{3} \rangle$

Excellent

$|\vec{v}| = \sqrt{(-2)^2 + 1^2 + 2^2} = \sqrt{4+1+4} = \sqrt{9} = 3$

3. Find $\vec{u} \cdot \vec{v}$. $\vec{a} \cdot \vec{b} = (a_1 \cdot b_1) + (a_2 \cdot b_2) + (a_3 \cdot b_3)$

$\langle 3 + 2 + (-1) \rangle \cdot \langle (-2), 1, 2 \rangle = -6 + 2 + (-2) = -6$

Great

4. Find the angle between $\vec{u}$ and $\vec{v}$.

$\cos\theta = \frac{a \cdot b}{|a||b|} = \frac{-6}{(\sqrt{14})(3)} = \frac{-2}{\sqrt{14}}$

We know...

$a \cdot b = -6$

$|a| = \sqrt{14}$

$|b| = 3$

So... $\theta = \cos^{-1}\left(\frac{-2}{\sqrt{14}}\right)$

Excellent