

Quiz 1 Calculus 3 8/31/2011

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 $3\mathbf{a} - \mathbf{b}$.

$$\mathbf{a} + \mathbf{b} = (5+4)\mathbf{i} - \mathbf{j} + (-4+2)\mathbf{k} = 9\mathbf{i} - \mathbf{j} - 2\mathbf{k}$$

$$3\mathbf{a} = 3(5\mathbf{i} - 4\mathbf{k}) = \cancel{15}\mathbf{i} - 12\mathbf{k} = 15\mathbf{i} - 12\mathbf{k}$$

$$3\mathbf{a} - \mathbf{b} = (15 - 4)\mathbf{i} + (0 - (-1))\mathbf{j} + (-12 - 2)\mathbf{k}$$

$$= 11\mathbf{i} + \mathbf{j} - 14\mathbf{k}$$

Great

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

$$\mathbf{v} = \langle 2, -1, 2 \rangle$$

$$\text{Mag} = \sqrt{2^2 + (-1)^2 + 2^2} = \sqrt{4+1+4} = \sqrt{9} = 3$$

$$\text{Unit Vector} = \frac{1}{\text{Mag}} \langle \mathbf{v} \rangle = \frac{1}{3} \langle 2, -1, 2 \rangle$$

$$\text{Unit Vector} = \left\langle \frac{2}{3}, -\frac{1}{3}, \frac{2}{3} \right\rangle$$

Great

3. Compute $\langle -3, 1, -2 \rangle \cdot \langle 2, 4, -1 \rangle$.

$$\langle -3, 1, -2 \rangle \cdot \langle 2, 4, -1 \rangle = (-3 \times 2) + (1 \times 4) + (-2 \times -1)$$

$$= -6 + 4 + 2 = 0$$

*Also means these vectors are perpendicular

Yes!