Math 173 - Quiz 1

Name __key__

January 22, 2015

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (3 points) Find a vector of magnitude $\sqrt{2}$ that has the direction of $\vec{u} = 3\hat{\imath} - 5\hat{\jmath} + 2\hat{k}$.

$$|\vec{u}| = \sqrt{(3)^2 + (-5)^2 + (2)^2} = \sqrt{9 + 25 + 4} = \sqrt{38}$$

$$\frac{\sqrt{2}}{\sqrt{38}} \left(3\hat{\imath} - 5\hat{\jmath} + 2\hat{k} \right) = \boxed{\frac{1}{\sqrt{19}} \left(3\hat{\imath} - 5\hat{\jmath} + 2\hat{k} \right)}$$

2. (3 points) Show that the points $P(1, 2, 3)$, $Q(-2, 7, 6)$, and $R(4, -3, 5)$ are not collinear.

$$\vec{PQ} = (-2-1)\hat{\imath} + (7-2)\hat{\jmath} + (6-3)\hat{k} = -3\hat{\imath} + 5\hat{\jmath} + 3\hat{k}$$

$$\vec{PR} = (4-1)\hat{\imath} + (-3-2)\hat{\jmath} + (5-3)\hat{k} = 3\hat{\imath} - 5\hat{\jmath} + 2\hat{k}$$

} THESE ARE NOT SCALAR MULTIPLES.

3. (2 points) The two-dimensional vector $\vec{w}$ has magnitude 8 and makes a 210° angle with the positive x-axis. Find the component form of $3\vec{w}$.

$$\vec{w} = 8 \cos 210° \, \hat{\imath} + 8 \sin 210° \, \hat{\jmath}$$

$$= 8 \left(-\frac{\sqrt{3}}{2} \right) \hat{\imath} + 8 \left(-\frac{1}{2} \right) \hat{\jmath}$$

$$= -4\sqrt{3}\,\hat{\imath} - 4\hat{\jmath} \implies 3\vec{w} = \boxed{-12\sqrt{3}\,\hat{\imath} - 12\hat{\jmath}}$$

4. (2 points) Compute $2\vec{u} - 3\vec{v}$ if $\vec{u} = \hat{\imath} - \hat{\jmath} + 7\hat{k}$ and $\vec{v} = 6\hat{\imath} - 10\hat{k}$.

$$2\left(\hat{\imath} - \hat{\jmath} + 7\hat{k} \right) - 3\left(6\hat{\imath} - 10\hat{k} \right)$$

$$= 2\hat{\imath} - 2\hat{\jmath} + 14\hat{k} - 18\hat{\imath} + 30\hat{k}$$

$$= \boxed{-16\hat{\imath} - 2\hat{\jmath} + 44\hat{k}}$$