Math 173 - Quiz 1

January 19, 2012

Name key

Score _____

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

1. (2 points) Find a vector perpendicular to the vector whose initial point is $(1, -4)$ and whose terminal point is $(-3, -6)$.

Q

P

$\overrightarrow{PQ} = (-3-1)\hat{\imath} + (-6-(-4))\hat{\jmath} = -4\hat{\imath} - 2\hat{\jmath}$

↑ Slope is $\frac{-2}{-4} = \frac{1}{2}$

⊥ slope is -2, Perp vector is $\hat{\imath} - 2\hat{\jmath}$

2. (2 points) Let $\vec{u} = 3\hat{\imath} - 2\hat{\jmath}$. Find the component form of the vector of magnitude 7 that has the same direction as $\vec{u}$.

$|\vec{u}| = \sqrt{(3)^2 + (-2)^2} = \sqrt{9+4} = \sqrt{13}$

$\frac{7}{\sqrt{13}}(3\hat{\imath} - 2\hat{\jmath}) = \boxed{\frac{1}{\sqrt{13}}(21\hat{\imath} - 14\hat{\jmath})}$

3. (3 points) The vector $\vec{u}$ has initial point $(-9, 2)$ and terminal point $(5, 1)$. The vector $\vec{v}$ has magnitude 4 and makes a $30°$ angle with the positive x-axis. Find the component form of $\vec{u} + \vec{v}$.

$\vec{u} = (5+9)\hat{\imath} + (1-2)\hat{\jmath} = 14\hat{\imath} - \hat{\jmath}$

$\vec{v} = 4\cos 30°\,\hat{\imath} + 4\sin 30°\,\hat{\jmath} = 2\sqrt{3}\,\hat{\imath} + 2\hat{\jmath}$

$\boxed{\vec{u} + \vec{v} = (14 + 2\sqrt{3})\hat{\imath} + \hat{\jmath}}$

4. (3 points) Let $\vec{w} = 3\hat{\imath} - 5\hat{\jmath} + 2\hat{k}$. Find a vector of magnitude 3 whose direction is opposite that of $\vec{w}$.

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

$-\frac{3}{\sqrt{38}}\vec{w} = \boxed{\frac{1}{\sqrt{38}}(-9\hat{\imath} + 15\hat{\jmath} - 6\hat{k})}$