Math 203 (Quenell) Name: ____________________

Quiz 1 13 September 2001

1. Let $\vec{v} = \vec{\imath} + 2\vec{\jmath}$ and $\vec{w} = 3\vec{\jmath} - \vec{k}$. Write the vector $2\vec{v} - \vec{w}$ in components.

   Solution: We have

$$\begin{aligned} 2\vec{v} - \vec{w} &= 2(\vec{\imath} + 2\vec{\jmath}) - (3\vec{\jmath} - \vec{k}) \\ &= 2\vec{\imath} + 4\vec{\jmath} - 3\vec{\jmath} + \vec{k} \\ &= 2\vec{\imath} + \vec{\jmath} + \vec{k}. \end{aligned}$$

2. Let $\vec{v} = 2\vec{\imath} + 4\vec{\jmath} + 4\vec{k}$. Find a unit vector $\vec{u}$ in the direction *opposite* the direction of $\vec{v}$. (Write your answer in components.)

   Solution: We have

$$\begin{aligned} ||\vec{v}|| &= \sqrt{4 + 16 + 16} \\ &= 6. \end{aligned}$$

   To get $\vec{u}$, we divide $\vec{v}$ by 6 and then multiply by -1. We get

$$\begin{aligned} \vec{u} &= -\frac{1}{6}(2\vec{\imath} + 4\vec{\jmath} + 4\vec{k}) \\ &= -\frac{1}{3}\vec{\imath} - \frac{2}{3}\vec{\jmath} - \frac{2}{3}\vec{k}. \end{aligned}$$

3. Let $\vec{v} = \vec{\imath} - 2\vec{\jmath}$ and $\vec{w} = t\vec{\imath} + 4\vec{\jmath}$. Find a value for t so that $\vec{v}$ and $\vec{w}$ are perpendicular.

   Solution: We want $\vec{v} \cdot \vec{w} = 0$, that is, we want to solve

$$t - 8 = 0.$$

   The solution is clearly $t = 8$.