Math 2401 (K1-K3)
1/14/2015

Quiz 1

(3pts.) **1.** Suppose that $\|\mathbf{u}\| = 3$ and $\|\mathbf{v}\| = 2$. Find $\mathbf{u} \cdot \mathbf{v}$, given that the angle between the two vectors is $\frac{\pi}{4}$.

(3pts.) **2.** Given the points:

$$P(1,2,3),$$
$$Q(1,4,3+\sqrt{5})$$

a). Express the vector $\overrightarrow{PQ}$ in component form.

b). Find the length of $\overrightarrow{PQ}$.

c). Find the direction of the vector $\overrightarrow{PQ}$.

(4pts.) **3.** Given the vectors:

$$\mathbf{u} = \langle 3, 1, -2 \rangle,$$
$$\mathbf{v} = \langle -4, 0, 1 \rangle$$

find $\mathbf{u} \times \mathbf{v}$ and $\mathbf{v} \times \mathbf{u}$.

① $\cos\theta = \dfrac{\vec{u}\cdot\vec{v}}{|\vec{u}|\,|\vec{v}|}$ (1pt. for formula) $\Rightarrow \cos\frac{\pi}{4} = \dfrac{\vec{u}\cdot\vec{v}}{3\cdot 2}$ (1pt.) $\Rightarrow \dfrac{\sqrt{2}}{2} = \dfrac{\vec{u}\cdot\vec{v}}{6} \Rightarrow \vec{u}\cdot\vec{v} = 3\sqrt{2}$ (1pt.)

② a). $\overrightarrow{PQ} = \langle 0, 2, \sqrt{5} \rangle$ (1pt.) 1/3pt./component

b). $|\overrightarrow{PQ}| = \sqrt{4+5} = 3$ (1pt.)

c). direction $= \dfrac{\overrightarrow{PQ}}{|\overrightarrow{PQ}|} = \langle 0, 2/3, \sqrt{5}/3 \rangle$ (1pt.) 1/3pt./component

③ $\vec{u}\times\vec{v} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 3 & 1 & -2 \\ -4 & 0 & 1 \end{vmatrix} = \vec{i}\begin{vmatrix} 1 & -2 \\ 0 & 1 \end{vmatrix} - \vec{j}\begin{vmatrix} 3 & -2 \\ -4 & 1 \end{vmatrix} + \vec{k}\begin{vmatrix} 3 & 1 \\ -4 & 0 \end{vmatrix}$

$= \langle 1, 5, 4 \rangle$ 3pts./component

$\vec{v}\times\vec{u} = \langle -1, -5, -4 \rangle$ 1pt.