Math 208, Summer 2007, Exam 1

Show your work. Justify your conclusions.

[4] **1**. Find the center and radius of the sphere given by $x^2 - 4x + y^2 + z^2 + 2z = 1$.

2. Let $P(1,1,2)$, $Q(4,0,-1)$ and $R(-2,3,1)$ be points in $\mathbf{R}^3$.

[3] **a**. Write $\overrightarrow{RQ}$ in component form.

[4] **b**. Write $\overrightarrow{RQ}$ in the form (magnitude) $\times$ (direction).

[4] **c**. Find the vector of magnitude 3 that points opposite $\overrightarrow{PQ}$.

[3] **d**. Find a point $S \in \mathbf{R}^3$ such that $\overrightarrow{PQ} = \overrightarrow{RS}$.

3. Let $\vec{u} = \langle 1, 2, -1 \rangle$, $\vec{v} = \langle 3, 1, 0 \rangle$ and $\vec{w} = \langle -2, 2, 1 \rangle$.

[4] **a**. Compute $|2\vec{w} - 3\vec{v}|$.

[4] **b**. Compute $\text{proj}_{\vec{w}}\ \vec{v}$.

[4] **c**. Compute the component of $\vec{w}$ along $\vec{u}$

[4] **d**. Compute the angle between $2\vec{v}$ and $\vec{w}$.

4. Let $\vec{u}$, $\vec{v}$ and $\vec{w}$ be as in problem 3.

[4] **a**. Compute $\vec{v} \times \vec{w}$.

[4] **b**. Find a vector that is orthogonal to $\vec{v}$ and $\vec{w}$.

[4] **c**. Compute the area of the parallelogram formed by $\vec{v}$ and $\vec{w}$.

[4] **d**. Compute the volume of the parallelpiped formed by $\vec{u}$, $\vec{v}$ and $\vec{w}$.