MATH 275 – Section 003 – Quiz 1

You may work with other class members on this quiz, but you may not receive assistance from people not in MATH 275 (Section 003). You must show all of your work to receive full credit. Do all your work on other sheets of paper and be sure to staple all the pieces of paper together or YOU WILL GET A ‘ZERO’ ON THE QUIZ. Do not use decimal approximations unless asked to do so. Your work on this quiz must be handed in by Wednesday, 8 September 2004 at 1900. GOOD LUCK!

1) Find the radius and center of the sphere given by the equation
\[ x^2 + 8x + y^2 - 12y + z^2 - 2z = 0. \]

2) A 50 pound weight is suspended from the ceiling by two strings. One string makes an angle of 30 degrees with the ceiling. The other string makes an angle of 45 degrees with the ceiling. Find the magnitude of tension in each string. Give exact answers and decimal approximations.

3) Consider the triangle whose vertices are the points \((0,1,2), (-1,2,-1), \) and \((2, 1, 0)\).
   a) Find the area of this triangle.
   b) Is this triangle a right triangle? Explain.
   c) Is this triangle an isosceles triangle? Explain.

4) Find all unit vectors orthogonal to both
\[
\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}
\text{ and } \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}.
\]

5) Prove:
\[ \mathbf{a} \cdot (\mathbf{b} \times \mathbf{c}) = (\mathbf{a} \times \mathbf{b}) \cdot \mathbf{c}, \]
where \(\mathbf{a}, \mathbf{b},\) and \(\mathbf{c}\) are vectors of three components each.