Quiz 3

Each problem is worth 2 points. Please show your work. No calculators or technology allowed, but it is OK to leave work in relatively unsimplified form.

1. What is a quadratic surface? Write down the general equation that such a surface must satisfy. Be sure to specify which coefficients cannot be zero.

2. Consider the equation $x^2 + 2y^2 = z^2 - 1$. Sketch the graph of this surface. Where does the graph cross the $z$–axis? What do horizontal cross sections of the graph (i.e. intersections of the graph with planes of the form $z = h$) look like?

3. Let $P$ be the point whose rectangular coordinates are $(0, 1, \sqrt{3})$. Write $P$ in both cylindrical and spherical coordinates.
4. Consider the equation $r = 1$ in cylindrical coordinates. Sketch the graph of this equation.

5. Consider a sphere of radius 2 centered at the origin. Write down an equation in spherical coordinates that describes the portion of this ball that lies in the 1st octant (i.e. that describes the 1/8 of the ball situated along the positive $x-$, $y-$, and $z-$axes.)