MAT 301
Assignment 10

Friday November 22, 2013

For full credit on these problems, each must be submitted with a complete and clear solution, showing all of your work. You may work with other classmates on these problems, but please indicate on your assignment if you received help. Partial answers and incomplete solutions may be eligible for some partial credit, depending on the level of completeness and demonstrated understanding.

1. Let $P = (2, -3, 4)$, $Q = (1, 2, -3)$, $R = (5, 2, 1)$, and $S = (-6, 2, 0)$ be points in $\mathbb{R}^3$

   (a) Find a set of parametric equations of the line that passes through points P and Q.

   (b) Find the distance between the line you found in part (a) and the point R.

   (c) Find an equation of the plane that passes through the three points P, Q, and R.

   (d) Find the distance between the plane that you found in part (c) and the point S.

2. Identify and sketch (do your best!) the following quadric surfaces.

   (a) $4x^2 + 9y^2 + z^2 - 16x + 18y + 9 = 0$

   (b) $4x^2 - 25y^2 - z^2 + 24x - 50y + 4z - 93 = 0$

3. Find an equation of the surface satisfying the following conditions, and identify the surface : The set of all points equidistant from the point $(0, 0, 4)$ and the xy-plane.

4. The surface given by the equation $x^2 + y^2 + z^2 - 16z = 0$ is given in rectangular coordinates.

   (a) Identify the surface.

   (b) Find an equation for this surface in cylindrical coordinates.

5. The surface given by the equation $x^2 + y^2 - 9z^2 = 0$ is given in rectangular coordinates.

   (a) Identify the surface.

   (b) Find an equation for this surface in spherical coordinates.