Math 126D - Spring 2009
Practice Problems for Midterm 1

1. Find the equation of the plane containing the line of intersection of the two planes

$$x + y + z + 5 = 0 \text{ and } 3x + 2y - z + 2 = 0$$

and the point $(1, 2, 1)$.

2. Find the point of intersection of the two lines

$$x = 4 - t, y = 6 + 2t, z = -1 + 3t \text{ and } x = 1 + 2t, y = 14 - 8t, z = 7 - 4t.$$

3. Let S be the surface defined as the set of points p (in three-dimensional space) such that the distance from p to the plane $y = 5$ equals the distance from p to the line

$$y = 1, z = 2.$$

(a) Find an equation for S.

(b) Find the equation of the trace of S in the plane $z = 6$. Describe the trace (i.e. what kind of curve is it?).

4. Consider the curve defined by the vector equation

$$\overrightarrow{r}(t) = \langle 4t, 5t^3, 2t^2 \rangle$$

(a) Find the unit tangent vector $\overrightarrow{T}(t)$ at the point where $t = 1$.

(b) Find the parametric equations of the tangent line the curve at the point where $t = 1$.

5. Does the curve defined by the polar equation

$$r = \sec\theta + \tan\theta$$

intersect the vertical line $x = 2$? Explain.

6. Compute the distance from the point $(1, 2, 3)$ to the plane $3x + 2y + z = 1$.

7. Find a vector function $\mathbf{r}(t)$ that represents the curve of intersection of the surfaces $9x^2 + (z-1)^2 = 4$ and $y = 5x^2$.

8. Let $\mathbf{r}(t) = \langle\, t^3, t^2 - 3t \,\rangle$. Find the arclength of this curve between the points $(-1, 4)$ and $(1, -2)$. Set up the integral, but do not evaluate.