Math 217 Assignment 2

Due Friday September 25

■ Problems from the text (do NOT turn in these problems):

- Section 13.5: 1, 6–12, 19–38, 52–56, 62–66, 68–72, 74–78.
- Section 13.6: 3–8, 21–28, 32–36, 41–46, 49–50.
- Section 14.1: 1–6, 7–12, 14–15, 26–28, 41–42.
- Section 14.2: 6–8, 12–16, 18–20, 24–26, 30–32, 36–40, 46–51.

■ Problems to turn in:

1. Find the equation of the plane that passes through the line of intersection of the planes $x - z = 1$ and $y + 2z = 3$ and is perpendicular to the plane $x + y - 2z = 1$.
2. Check whether the lines given by the parametric equations

$$\begin{cases} x &= 1 + t \\ y &= 1 + 6t \\ z &= 2t \end{cases} \qquad \text{and} \qquad \begin{cases} x &= 1 + 2s \\ y &= 5 + 15s \\ z &= -2 + 6s \end{cases}$$

   are parallel, intersecting or skew. If they are non-intersecting, find the distance between them.
3. Find an equation for the surface consisting of all points P for which the distance from P to the x-axis is twice the distance from P to the yz-plane. Identify the surface.
4. Show that the curve of intersection of the surfaces

$$x^2 + 2y^2 - z^2 + 3x = 1 \qquad \text{and} \qquad 2x^2 + 4y^2 - 2z^2 - 5y = 0$$

   lies in a plane.
5. The positions of two moving particles are given by the vector equations

$$\mathbf{r}_1(t) = \langle t, t^2, t^3 \rangle \qquad \text{and} \qquad \mathbf{r}_2(t) = \langle 1 + 2t, 1 + 6t, 1 + 14t \rangle,$$

   where t denotes time. Do the particles collide? Do their paths intersect?
6. Find the parametric form of the tangent line to the curve

$$x = \ln t, \quad y = 2\sqrt{t}, \quad z = t^2$$

   at the point $(0, 2, 1)$.
7. At what point do the curves

$$\mathbf{r}_1(t) = \langle t, 1 - t, 3 + t^2 \rangle \qquad \text{and} \qquad \mathbf{r}_2(s) = \langle 3 - s, s - 2, s^2 \rangle$$

   intersect? Find their angle of intersection.
8. Evaluate the integral

$$\int_0^1 \left(\frac{4}{1 + t^2}\mathbf{j} + \frac{2t}{1 + t^2}\mathbf{k} \right) dt.$$