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, 68–72, 74–78.
  • Section 14.1: 1–6, 7–12, 14–15, 26–28, 41–42.

■ 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{align*}
   x &= 1 + t \\
   y &= 1 + 6t \\
   z &= 2t
   \end{align*}
   \quad \text{and} \quad
   \begin{align*}
   x &= 1 + 2s \\
   y &= 5 + 15s \\
   z &= -2 + 6s
   \end{align*}
   
   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
   \[x^2 + 2y^2 - z^2 + 3x = 1\]
   \[2x^2 + 4y^2 - 2z^2 - 5y = 0\]
   lies in a plane.
5. The positions of two moving particles are given by the vector equations
   \[\mathbf{r}_1(t) = \langle t, t^2, t^3 \rangle \quad \text{and} \quad \mathbf{r}_2(t) = \langle 1 + 2t, 1 + 6t, 1 + 14t \rangle,\]
   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
   \[\mathbf{r}_1(t) = \langle t, 1 - t, 3 + t^2 \rangle \quad \text{and} \quad \mathbf{r}_2(s) = \langle 3 - s, s - 2, s^2 \rangle\]
   intersect? Find their angle of intersection.
8. Evaluate the integral
   \[
   \int_0^1 \left( \frac{4}{1 + t^2} \mathbf{j} + \frac{2t}{1 + t^2} \mathbf{k} \right) dt.
   \]