Math 2415
Homework on 12.6

1. Sketch the generalized cylinders in $\mathbf{R}^3$ given by the following equations.

   (a) $4x^2 + y^2 = 16$

   (b) $xy = 4$

2. Sketch the following surfaces of revolution. Hint: You may find it helpful to convert the equation to cylindrical coordinates and rotate the resulting curve in rz-space about the z-axis.

   (a) $x^2 + y^2 - z = 2$

   (b) $y^2 - 9x^2 + z^2 = 1$ [For this example you will need to modify the hint!]

3. Sketch the following families of curves in the (x, y)-plane. Be sure to label the coordinates of any intercepts and include any asymptotes in your sketches.

   (a) $4x^2 + y^2 = c^2$ for $c = 0$, 1, 4.

4. Use traces (slices) to sketch and identify the **surfaces** in $\mathbf{R}^3$ given by the following equations.

   (a) $\frac{x}{4} = \frac{y^2}{4} + \frac{z^2}{9}$

   (b) $y^2 = x^2 + z^2$

   (c) $y^2 + 4x^2 - 9z^2 = 36$

5. Sketch the surface obtained by rotating the line $y = 2x$ about the y-axis. What is the equation for this surface?

6. Make a single sketch showing the following three surfaces: $y^2 - x^2 + z^2 = -1$, $y^2 - x^2 + z^2 = 0$, and $y^2 - x^2 + z^2 = 1$. Hint: Convert to an appropriate cylindrical coordinate system.