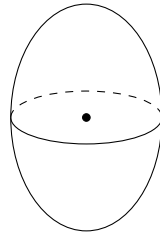


**MATH 231: Calculus of Several Variables**  
**Section 1, 107 Ag Sc & Ind Bldg,**  
**TR 9:05 AM - 9:55 AM**

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**Homework 7:** Due Thursday, Sept 26

1. Read the notes titled “Cylinders and Quadric Surfaces”
2. Determine if the following equation is a cylinder. You may use the grapher on the website to check your work.
  - (a)  $z = y$
  - (b)  $x + y + z = 12$
  - (c)  $x^2 + y^2 = 16 + z$
3. Write an equation for the following descriptions of surfaces below. (When the scaling constants like  $p$ ,  $q$ , and  $r$  don't matter, you may use 1. They will matter for the ellipse.) Feel free to check your work by graphing these surfaces on Wolfram Alpha.
  - (a) A paraboloid opening along the  $y$ -axis centered at the point  $(1, 0, 0)$
  - (b) A hyperboloid of two sheets opening along the  $z$ -axis, centered at  $(0, 1, 0)$
  - (c) An ellipse centered at  $(1, 1, 1)$ , where the figure is longer along the  $z$ -axis than the  $x$  and  $y$  axes (pictured below).



4. Classify and sketch the graph. (That is, complete the square, match the formula to one of the quadric figures, and sketch the figure keeping in mind the orientation.) Feel free to check your work by graphing these surfaces on Wolfram Alpha.
  - (a)  $x^2 - y^2 + z^2 - 2x + 4y - 6z + 5 = 0$
  - (b)  $-x^2 - y^2 + z^2 + 4x + 2y - 6z + 4 = 0$
  - (c)  $-x^2 + y^2 + 4x - 2y - z - 3 = 0$