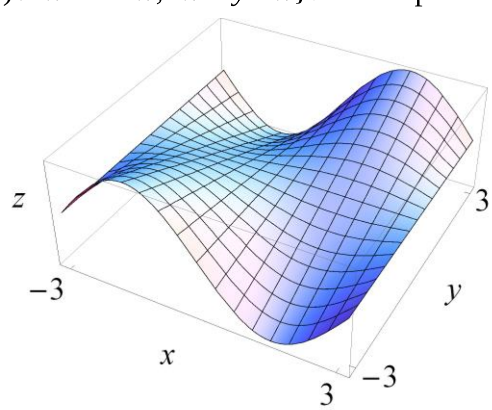
ACTIVITY #5 –FAMILIES OF CURVES, GRAPHS, AND CONTOUR DIAGRAMS

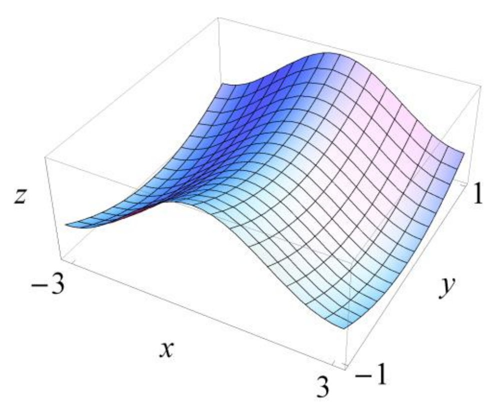
Name:__________________________________

Functions of two variables are graphed in problems 1 and 2 and other surfaces are graphed in problem 3. In all problems it is convenient to think of transformations of functions of one variable. The technique of transversal sections is used. Start by looking at the given formula and decide which variable you will give values to. Look for a variable that when given different values will produce transformations of a curve you are familiar with. Place the resulting family of curves in space. You may also give a value to some other variable in order to obtain a framework upon which to place the family of curves you previously obtained.

1. For each one of the following problems (a) through (d) do both, part (i) and part (ii):
   i. Give enough values to a chosen variable until you can imagine how the graph of $z = f(x, y)$ looks in space. Give a value to some other variable to make sure the graph you imagine is correct. Draw the graph as carefully as you can and if necessary add a verbal description.
   ii. Draw a contour diagram for the function $z = f(x, y)$ as carefully as you can and **verify that your diagram is consistent with the graph you drew in the previous part**. You must draw enough contours so that the behavior of the function in all of its domain may be deduced. **Show all your work.**
      a. $f(x, y) = x - y^2$ b. $f(x, y) = (x + y)^2$
      c. $f(x, y) = \sqrt{x - y}$ d. $f(x, y) = \sqrt{y - x^2}$

2. The graphs of the following functions are represented on the domain given by the set $\{(x, y): -\pi \le x \le \pi, -\pi \le y \le \pi\}$. Find a possible formula for each function.

a. 


b. 


3. Use sections to draw the graph of each of the following surfaces. Some of the sections may turn out to be hyperbolas (review how to graph them). **Show all your work.**
   a. $x^2 + y^2 - z^2 = 1$ b. $x^2 + y^2 = z^2$