Lesson 17. Level Curves

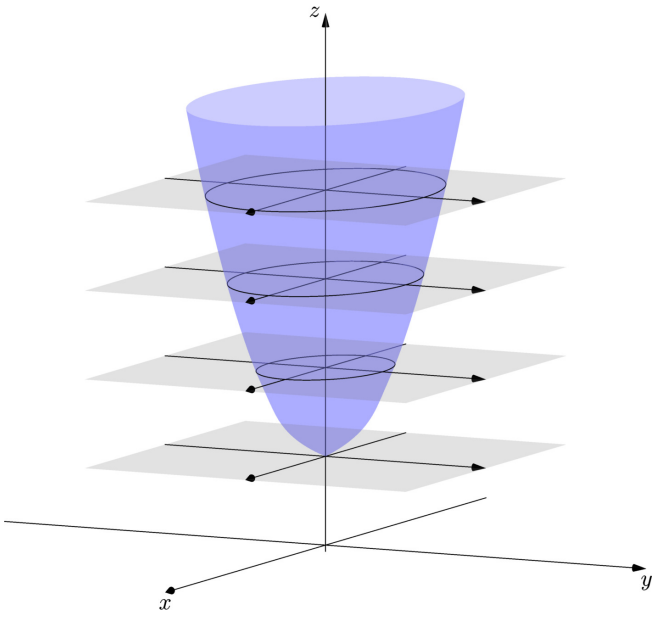
1 This lesson...

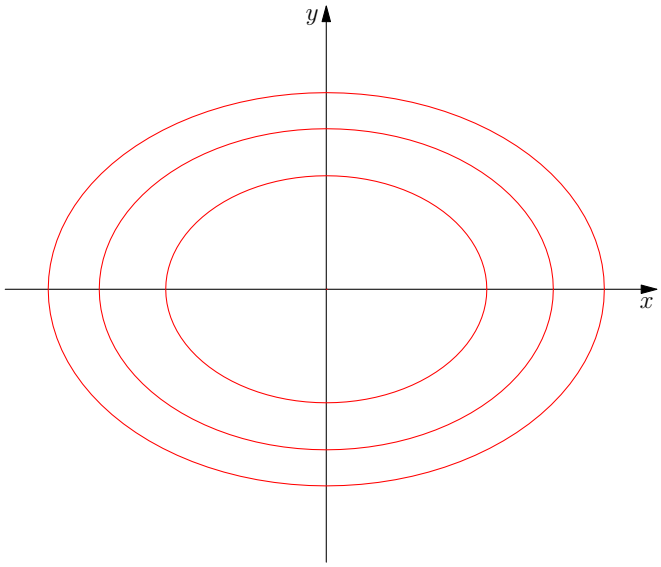
- Another way of visualizing functions of 2 variables

2 What is a level curve?

- The **level curves** of a function $f(x, y)$ are the curves of the equations _____, where k is a constant
  - These curves show where the graph of f has height k, for different values of k
  - Sometimes called *contour maps*

Example 1. Below is a graph of $f(x, y) = x^2 + 2y^2 + 1$, and the level curves of f for values of $k = 1, 2, 3, 4$.

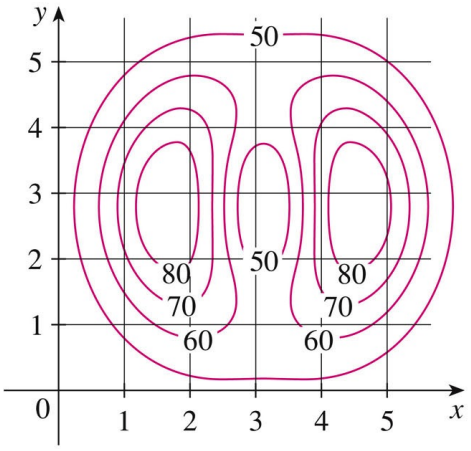




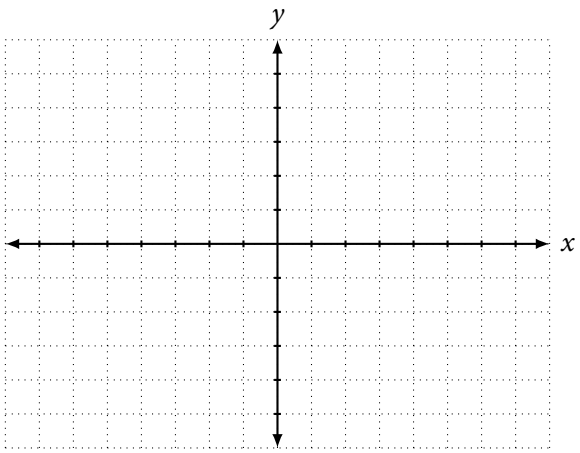
- Level curves are close together ⇔ _____
- Level curves are farther apart ⇔ _____

3 Examples

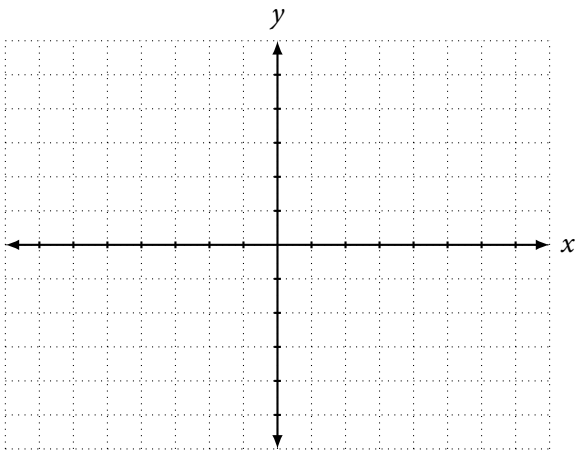
Example 2. The contour map for a function f is given below. Use it to estimate the values of $f(1,3)$ and $f(4,5)$. What can you say about the shape of the graph of f?



Example 3. Sketch the level curves of the function $f(x,y) = 6 - 3x - 2y$ for the values $k = -6, 0, 6, 12$.

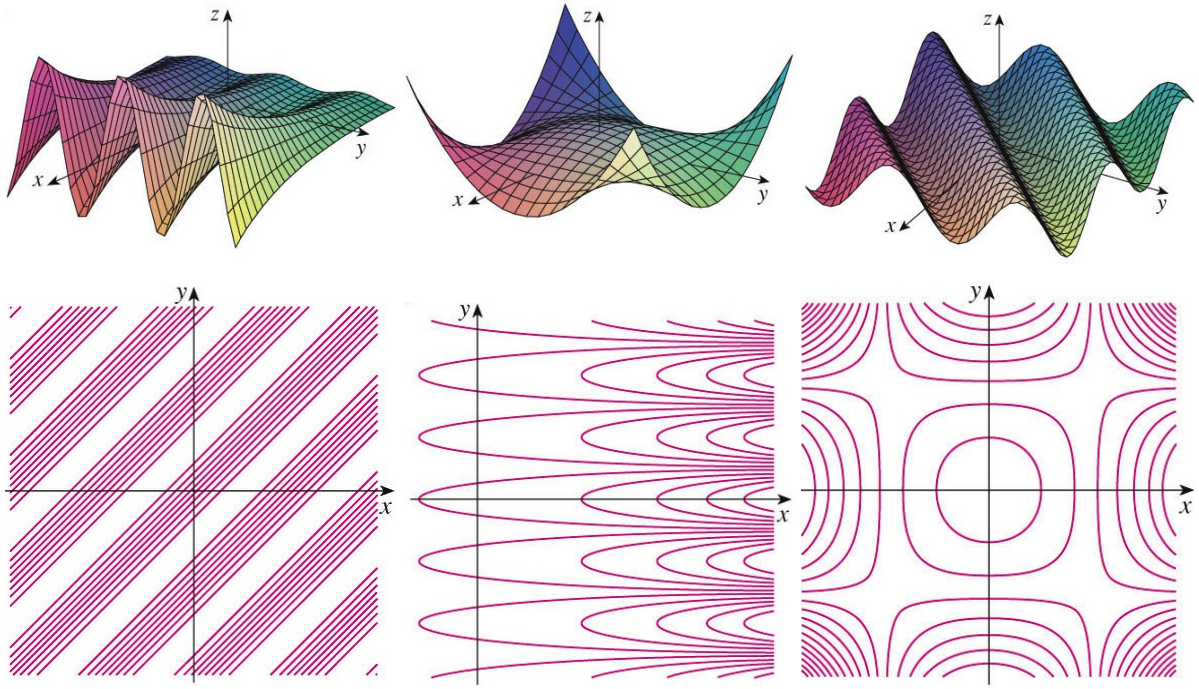


Example 4. Sketch the level curves of the function $f(x,y) = \sqrt{x} - y$ for the values $k = 0, 1, 2, 3$.



Example 5. Match the function with its graph and contour map.

a. $f(x, y) = (1 - x^2)(1 - y^2)$ b. $f(x, y) = \sin(x - y)$ c. $f(x, y) = e^x \cos y$



Example 6. What is the difference between the functions depicted by the contour maps below?