# Lesson 12. 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 $k = 1, 2, 3, 4$.
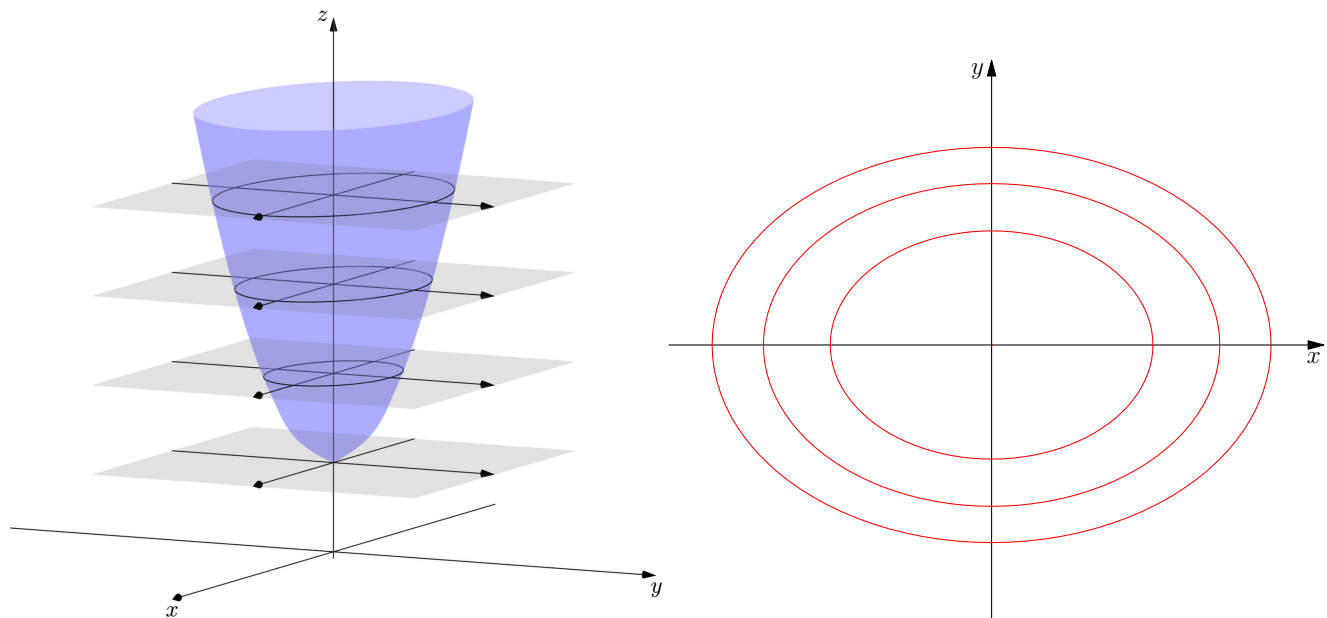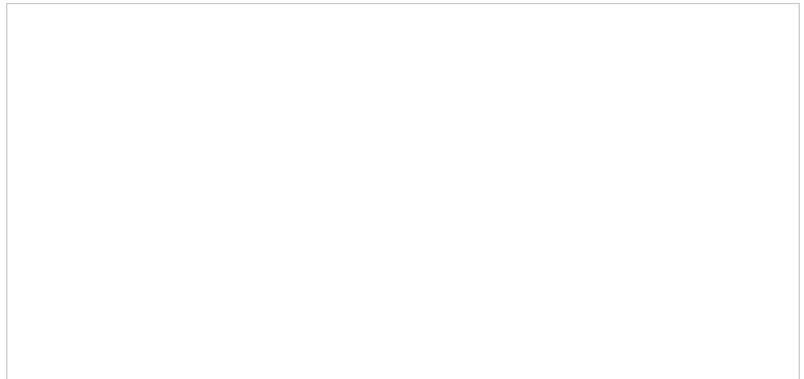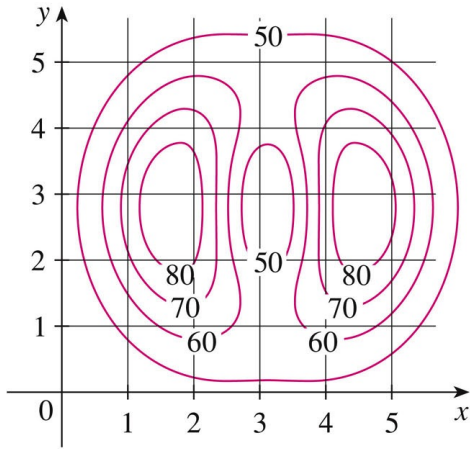

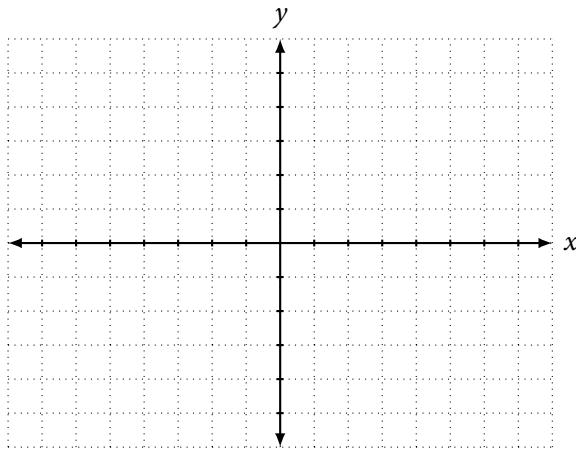- Level curves are close together $\Leftrightarrow$ [   ]

- Level curves are farther apart $\Leftrightarrow$ [   ]
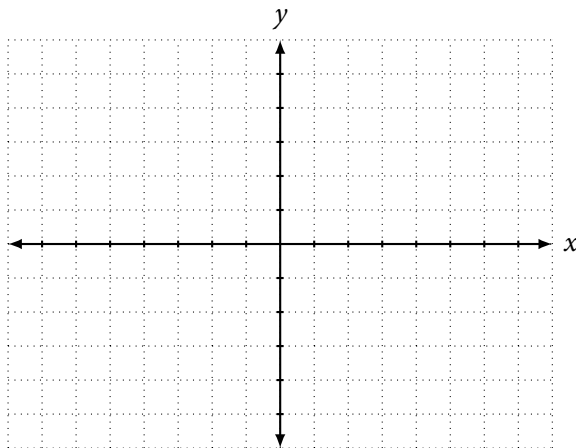
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3 Examples

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 $k = -6, 0, 6, 12$.
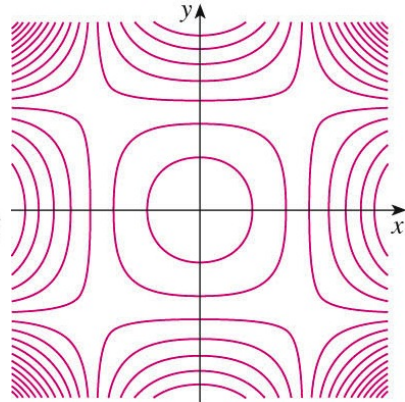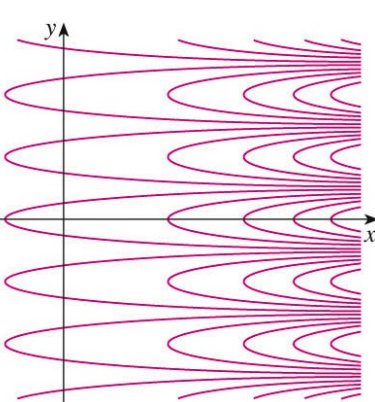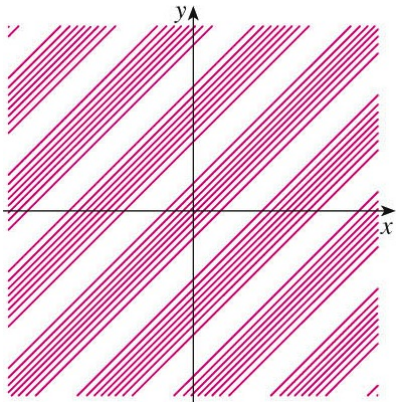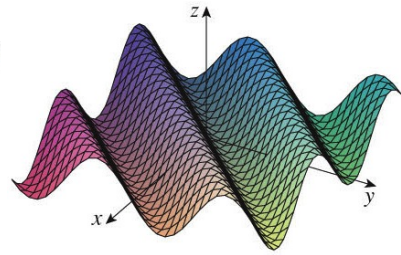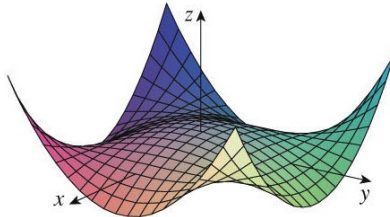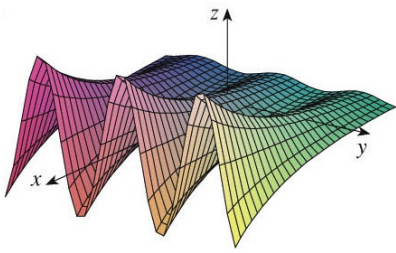

Example 4. Sketch the level curves of the function $f(x, y) = \sqrt{x} - y$ for the values $k = 0, 1, 2, 3$.

2

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?

3