

## 7.1: Functions of multiple variables (cont.)

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## The domain of $f(x, y)$ : example I

Find the domain of  $f(x, y) = \sqrt{9 - x^2 - y^2}$ .

## The domain of $f(x, y)$ : example II

Find the domain of  $f(x, y) = \frac{x}{\ln(x + y)}$ .

# Graphs of functions of 2 variables: think in 3D!

## Graphs of functions of 2 variables via level curves

**Question:** How can we sketch the graph of a particular function, say  $f(x, y) = x^2 + y^2$ ?

**Idea:** Use “level curves”: slice your graph by horizontal planes.

# Level curves

The intersection of the plane  $z = h$  with the graph  $f(x, y)$  is called the “the level curve of  $f(x, y)$  at  $z = h$ ”, described by the equation  $f(x, y) = h$ .

For a cool interactive page on level curves, [check this out!](#)

## Level curves: Example I

Based on level curves of  $f(x, y) = x^2 + y^2$ , what does its graph look like?

## Example I (cont.)



## Example II

Sketch the level curves  $z = -2, -1, 0, 1, 2$  for  $f(x, y) = \frac{x}{y}$ .

## Example III

Sketch the level curves  $z = -1, 0, 1, 4$  for  $f(x, y) = x^2 + y$ .