

## Section 15.1 – Graphs and Level Curves

- Function, Domain, and Range with Two Independent Variables: A function  $z = f(x, y)$  assigns to each point  $(x, y)$  in a set  $D$  in  $\mathbb{R}^2$  a unique real number  $z$  in a subset of  $\mathbb{R}$ . The set  $D$  is the domain of  $f$ . The range of  $f$  is the set of real numbers  $z$  that are assumed as the points  $(x, y)$  vary over the domain.
- Find the domain of the following functions:

- $f(x, y) = \frac{1}{\sqrt{x^2 + y^2 - 25}}$

- $f(x, y) = \frac{\sqrt{y - x^2}}{1 - x^2}$

- $f(x, y) = \cos(x^2 - y^2)$

- Level Curves: For a function  $f$  of two variables, the contour curves or level curves are the curves with equations  $f(x, y) = k$ , where  $k$  is a constant (in the range of  $f$ ).
- Graph several level curves of the following functions in the given window.
  - $z = x^2 + y^2 \quad [-9, 9] \times [-9, 9]$

- $z = 3 \cos(2x + y)$

- $f(x, y) = x^3 - y$

