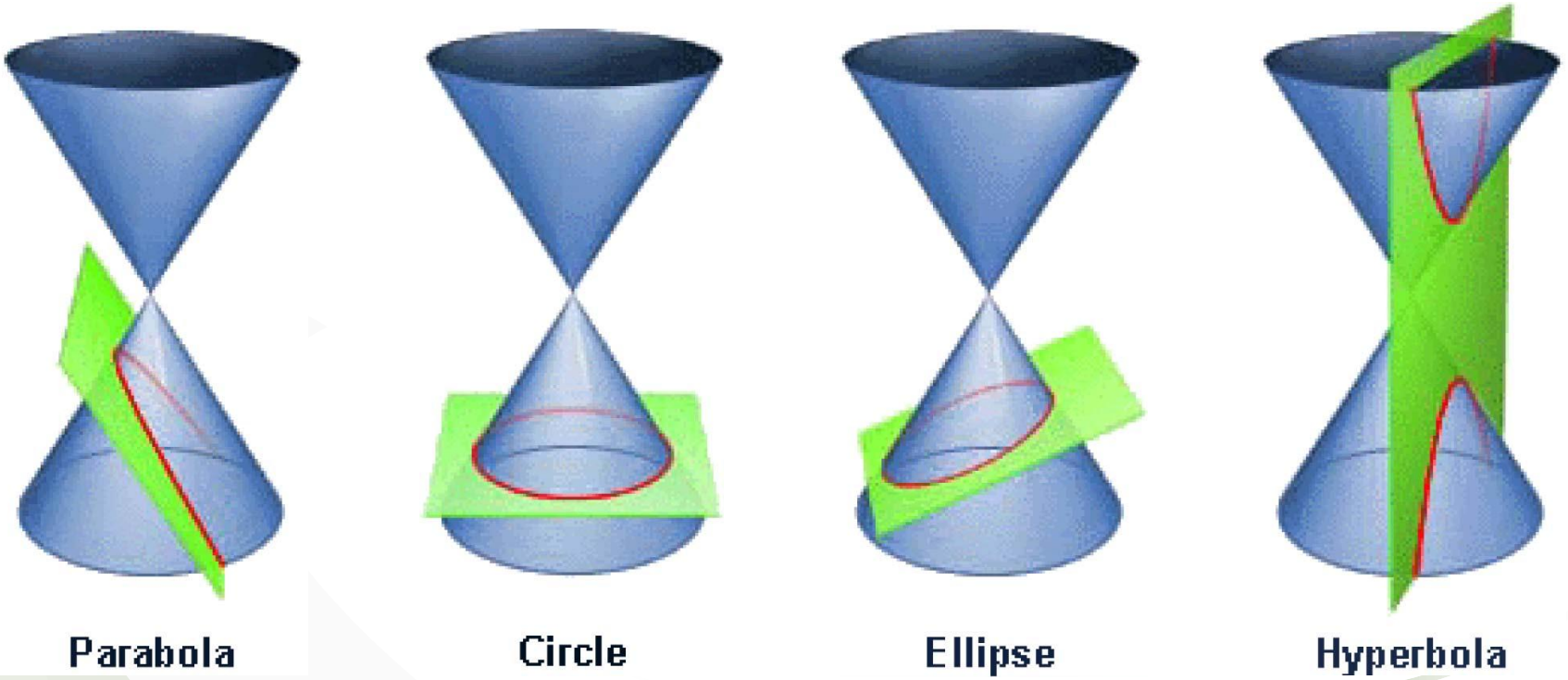
Conic Sections

Chapters 9 & 11

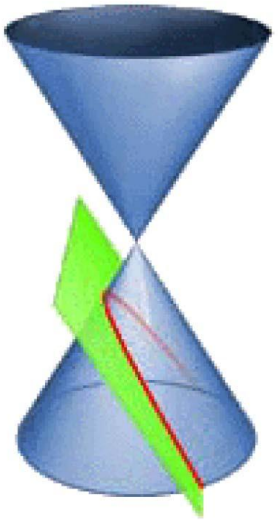
Written by: Cindy Alder

What are Conic Sections?

- **Conic Sections** are curves obtained by intersecting a right circular cone with a plane.

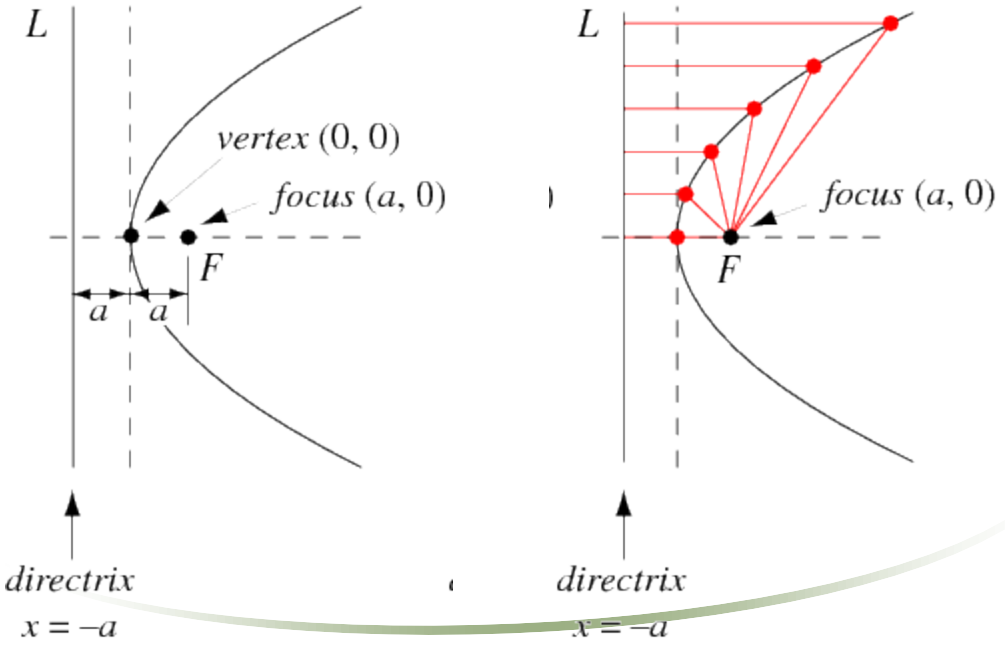


The Parabola



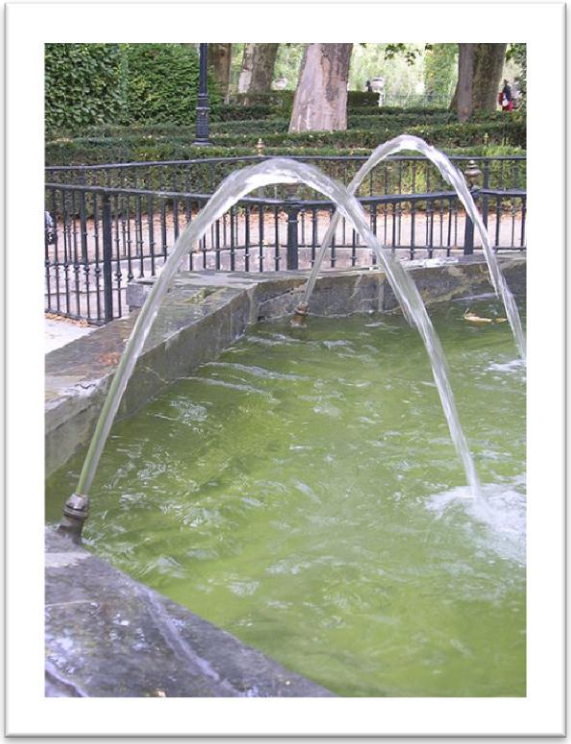
Parabola

- A ***parabola*** is formed when the plane cuts the cone parallel to the side of the cone.
- The definition of a **parabola** is the set of all points in a plane such that each point in the set is equidistant from a line called the **directrix** and a fixed point called the **focus**.



Parabolas in Nature

- Parabolas can be seen all around us in nature. One example is the parabolic trajectories of water in a fountain.



- Another example is that of a bouncing ball (captured with a stroboscopic flash at 25 images per second).

Parabolas in Physical Situations

- Parabolas are the most efficient design in accomplishing the goal of a satellite dish.

- Suspension bridge cables follow a parabolic curve. (Hercilio Luz Bridge, Florianopolis, Brazil)

9.5 Graphs of Quadratic Functions

OBJECTIVES:

- Graph a quadratic function.
- Graph parabolas with horizontal and vertical shifts.
- Use the coefficient of x^2 to predict the shape and direction in which a parabola opens.
- Find a quadratic function to model data.

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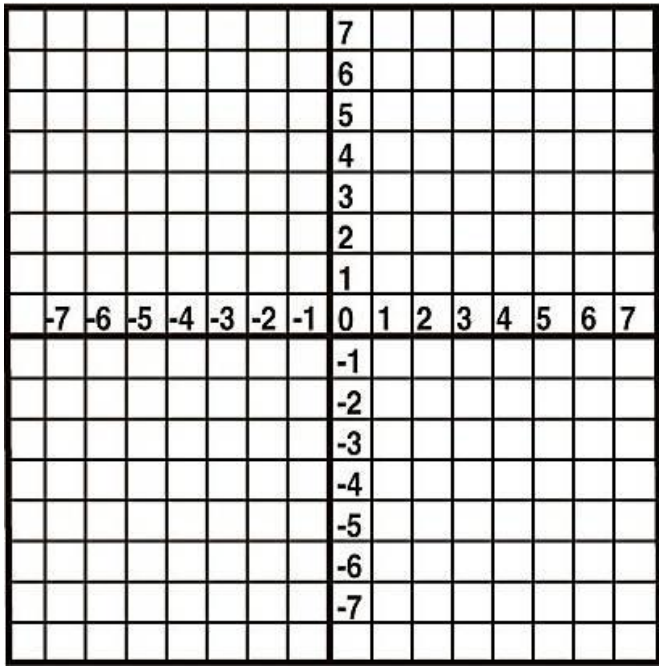
Simplest Quadratic Function (Parent Graph)

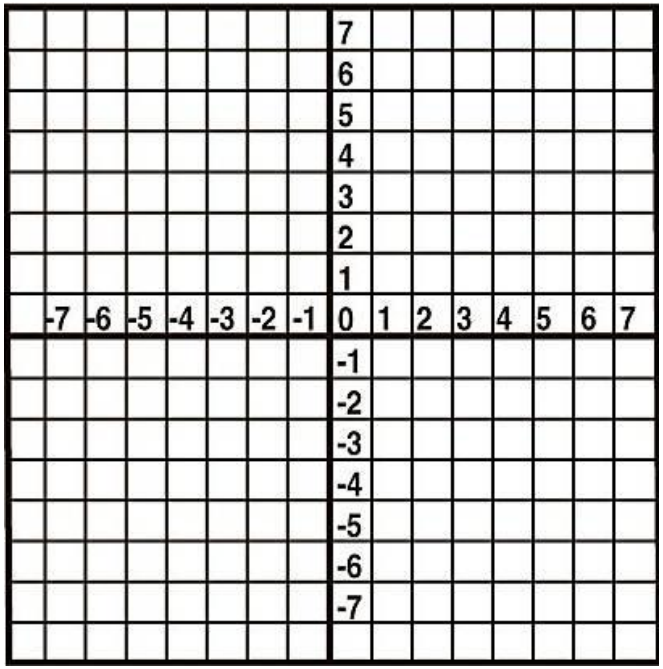
- Graph $f(x) = x^2$



http://nlvm.usu.edu/en/nav/frames_asid_109_g_3_t_2.html?op

Graph the following Quadratic Function

- Graph $f(x) = x^2 + 3$. State the vertex, domain and range.

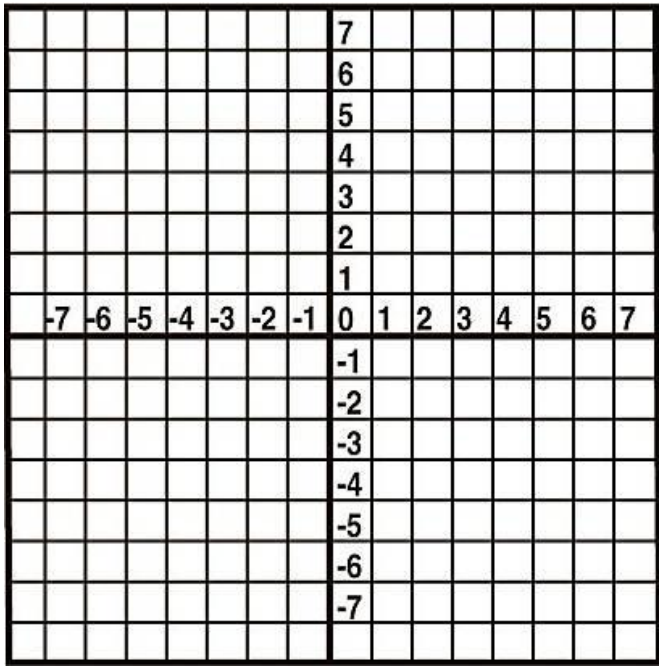


Vertical Shift

- The graph of $f(x) = x^2 + k$ is a parabola.
  - The graph has the _____ as the graph of _____.
  - The parabola is
    -
    -
  - The vertex of the parabola is _____.

Graph the following Quadratic Function

- Graph $f(x) = (x-3)^2$. State the vertex, domain and range.

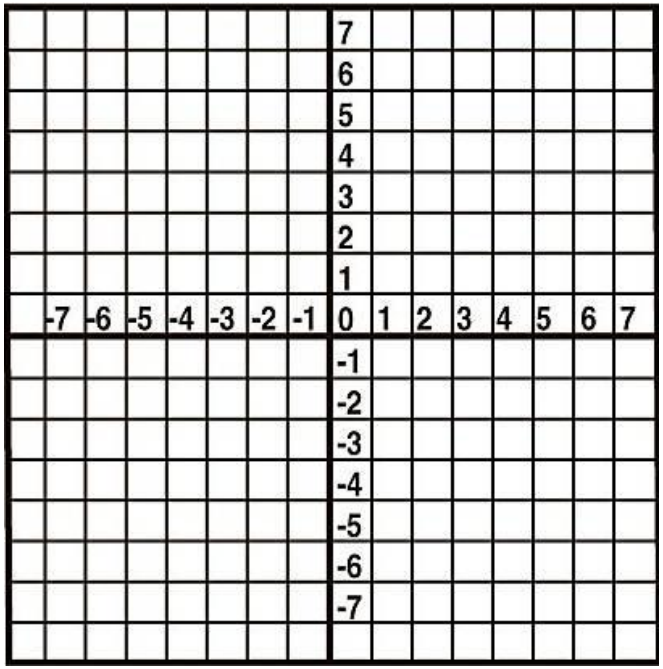


Horizontal Shift

- The graph of $f(x) = (x - h)^2$ is a parabola.
  - The graph has the _____ as the graph of _____.
  - The parabola is
    -
    -
  - The vertex of the parabola is _____.

Graph the following Quadratic Function

- Graph $f(x) = (x-2)^2 + 1$. State the vertex, domain and range.

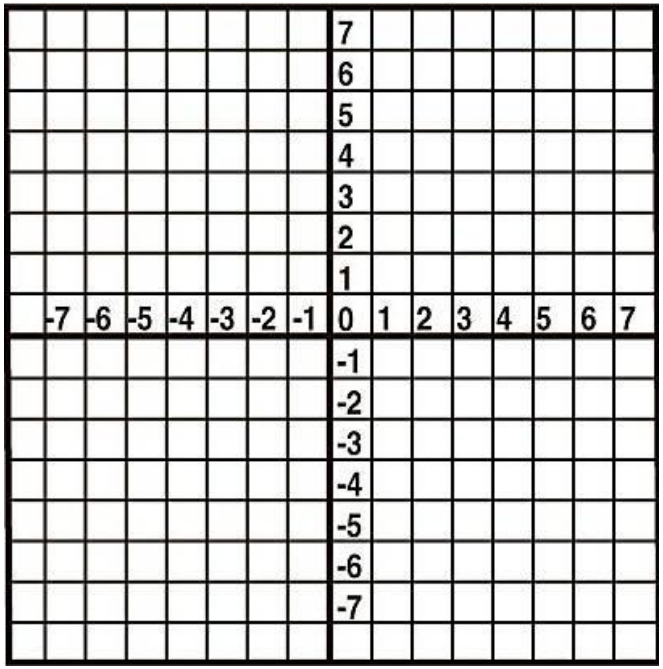


Vertex and Axis of a Parabola

- The graph of $f(x) = (x - h)^2 + k$ is a parabola.
  - The graph has the _____ as the graph of _____.
  - The vertex of the parabola is _____.
  - The axis is the vertical line _____.

Graph the following Quadratic Function

- Graph $f(x) = -x^2$. State the vertex, axis of symmetry, domain and range.

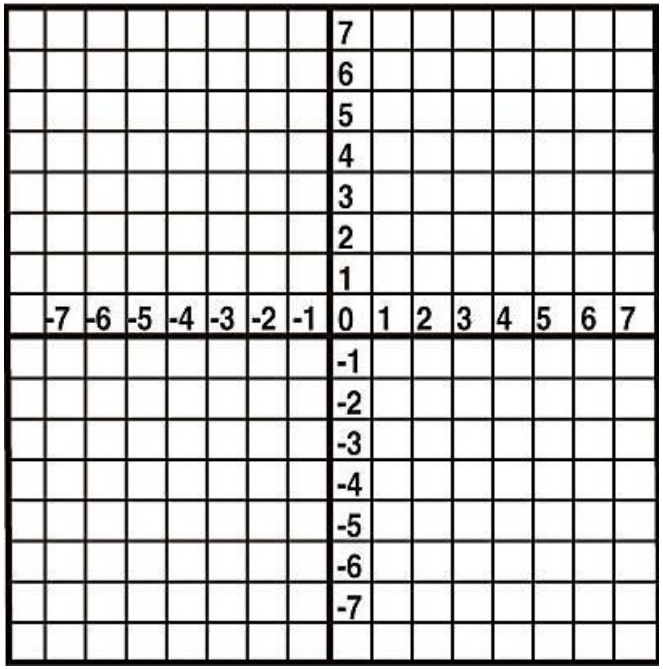


Direction of Opening

- The graph of $f(x) = a(x - h)^2 + k$ is a parabola that:
  - Opens:
  - Opens:

Graph the following Quadratic Function

- Graph $f(x) = 4x^2$ and $g(x) = \frac{1}{4}x^2$. State the vertex, axis of symmetry, domain and range.



Direction of Opening

- The graph of $f(x) = a(x - h)^2 + k$ is a parabola that is:
  - _____ than that of _____ if _____.
  - _____ than that of _____ if _____.

Describe the following Graphs

A. $f(x) = -\frac{2}{3}x^2$

B. $f(x) = 2(x+1)^2$

C. $f(x) = -3x^2 + 2$

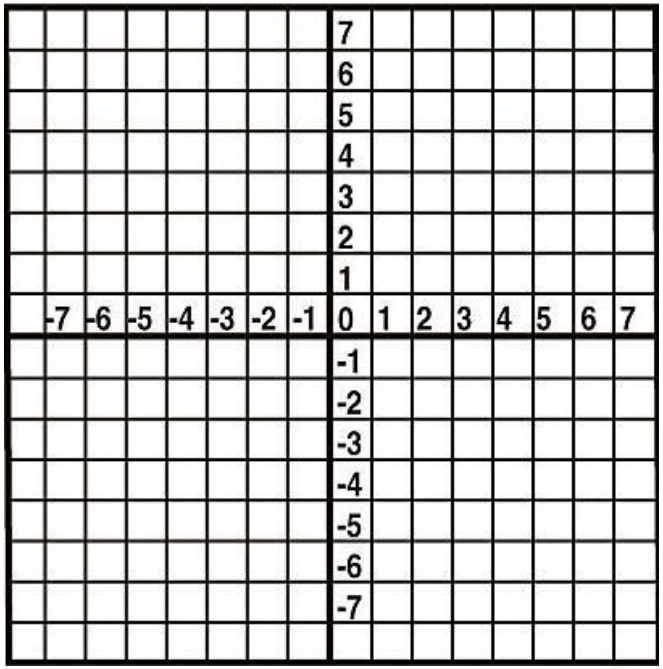
D. $f(x) = 2(x-2)^2 + 8$

E. $f(x) = -\frac{5}{2}(x+3)^2 - 9$

Describe and Graph

- Describe the graph in relation to $f(x) = x^2$. Then graph. State the vertex, axis of symmetry, domain and range.

$$f(x) = \frac{1}{2}(x-2)^2 + 1$$



Quadratic Functions that Model Data

- The quadratic function defined by

$$f(x) = -69.15x^2 + 863.6x + 4973$$

models the number of higher order multiple births, where x represents the number of years since 1995. Use this model to approximate the number of higher-order births in 2006 to the nearest whole number.