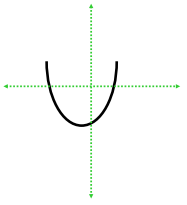
Chapter 8.4: Graphing Quadratic Functions

Objectives:

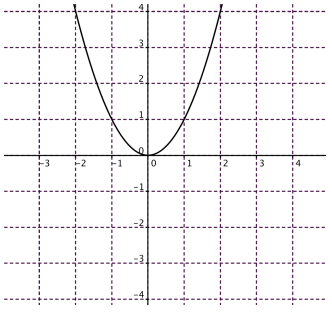
- ★ Determine the vertex of a parabola by completing the square or finding the x-intercepts.
- ★ Sketch a parabola.
- ★ Given a graph, write the equation of the parabola.
- ★ Use this information in application problems.

$3(x+1)^2 - 5 = y$



The graph of the basic quadratic function looks like this.

$y = x^2$



*Key items to note:

*Vertex at (0,0)

*Axis of symmetry

*Key symmetric points on the left and right of the vertex.

Transformations to the graph from $y = x^2$ to $y = a(x-h)^2 + k$ (standard form)

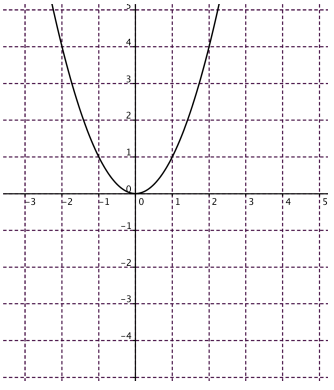
Stretch

Reflect

Shift

$y = -2(x-3)^2 - 1$

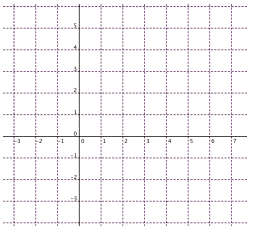
$y = x^2$	$y = 2x^2$	$y = -2x^2$	$y = -2(x-3)^2$	$y = -2(x-3)^2-1$
(0,0)				
(-1,1)				
(1,1)				



Two ways to graph a quadratic function are:

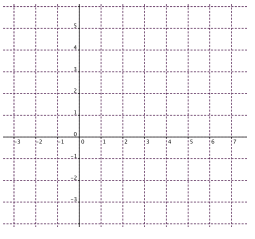
1. If it is in factored form
   a. Find the x-intercepts.
   b. Find the x-value halfway between the x-intercepts. This will be the x-value of the vertex.
   c. Determine the y-value of the vertex.
   d. Plot the vertex and intercepts.

$y = (x-3)(x+1)$



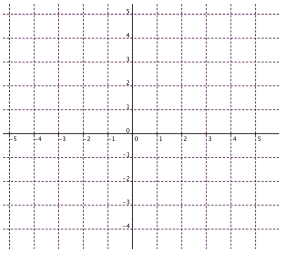
2. If it is not factorable or you prefer not to factor it
   a. Complete the square to put it in standard form.
   b. Plot the vertex.
   c. Plot the symmetric points 1 unit to the left and right of the vertex.

$y = x^2+6x+5$



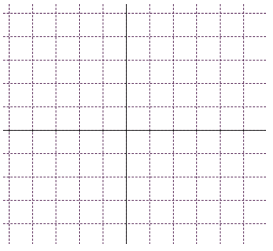
Ex 1: Find the vertex of this parabola by completing the square, then, sketch the parabola.

$f(x) = -x^2 - 4x - 3$



EX 2: Find the vertex of this parabola by factoring, then sketch it.

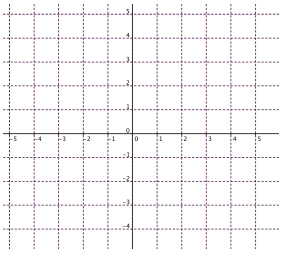
$f(x) = x^2 + 4x - 5$



Ex 3: Use symmetry to find the vertex of this parabola, then sketch it.

Hint: Find the y-intercept, then find the symmetric point at which it intersects with the line y = 5. Use these two points to determine the vertex.

$f(x) = 2x^2 + 6x + 5$

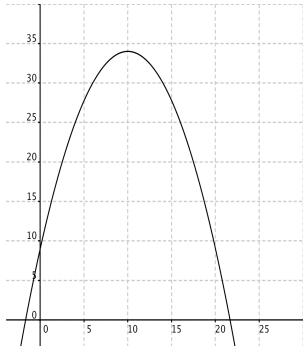


Ex 4: A child launches a toy spaceship from their treehouse. The height of the rocket is given by the function, $h(x) = -\frac{1}{4}x^2+5x+9$, where x is the horizontal distance in feet from the base of the tree.

a) Determine the height from which the spaceship is launched.

b) What is the maximum height the rocket attains?

c) How far from the base of the tree where it is launched does the rocket land? (Assume flat ground around the tree.)



Ex 5: Write an equation for this function in two different forms,

General: $y = ax^2+bx+c$

Standard: $y = a(x-h)^2+k$