Notes Quadratic Functions

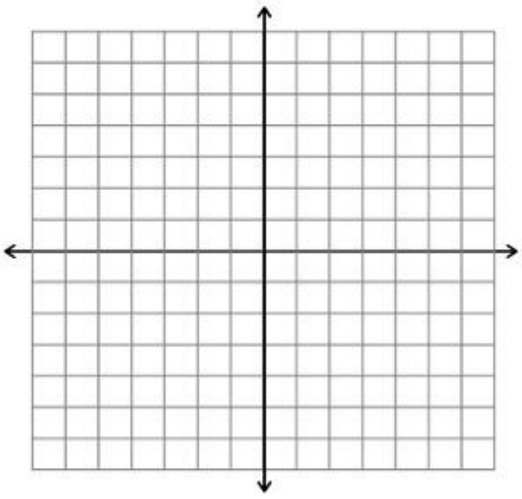
We are accustomed to seeing the general form of a quadratic function : $f(x) = ax^2 + bx + c$

The standard form of a quadratic function is: $f(x) = a(x-h)^2 + k$

Where (h,k) is the vertex of the parabola (the turning point) and a is the compression/stretch. If $a > 0$ the parabola opens **up**, if $a < 0$ the parabola opens **down**
Also, the parabola will be symmetric with respect to the line $x = h$

Determine the vertex, axis of symmetry and range of the following functions and graph them.

EX1: $f(x) = 2x^2$

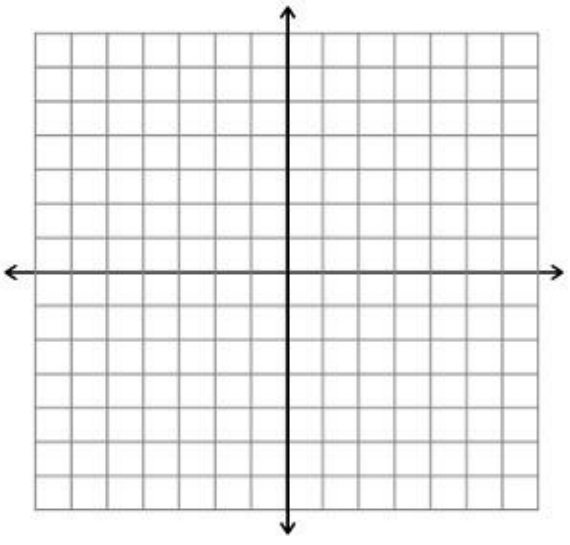


a) Vertex:_____

b) Axis of symmetry:_____

c) Range:_____

EX2: $f(x) = \frac{1}{4}x^2 - \frac{1}{2}$

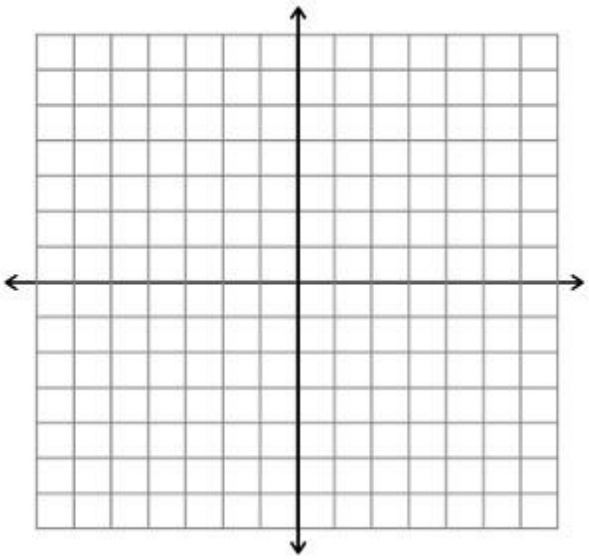


a) Vertex:_____

b) Axis of symmetry:_____

c) Range:_____

EX3: $f(x) = -3(x+1)^2 - 2$



a) Vertex:_____

b) Axis of symmetry:_____

c) Range:_____

Note: All of the functions above are in **standard form**. If function is ***NOT*** in standard form, all we need to do is determine the vertex (h,k) of that function and we can rewrite the equation in standard form.

$$f(x) = a(x-h)^2 + k$$

To find the standard form for any quadratic in the form $f(x) = ax^2 + bx + c$:

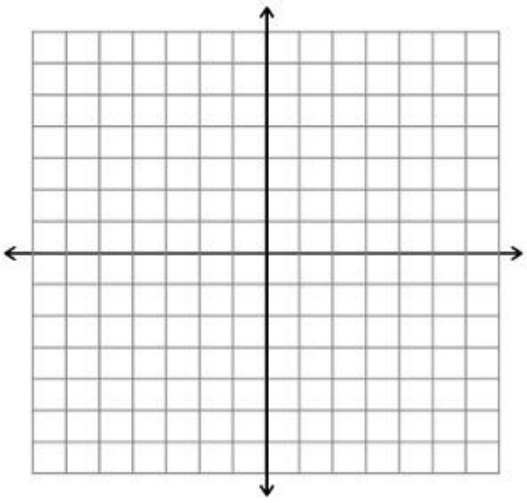
1. Find the vertex of the parabola: (h,k)

$$h = \frac{-b}{2a} \qquad k = f\left(\frac{-b}{2a}\right) \text{ or } k = f(h)$$

2. Plug in h, k and a into the formula $f(x) = a(x-h)^2 + k$

Determine the standard form of the function as well as the vertex and range. Then graph the function.

EX4: $f(x) = -x^2 - 4x - 3$

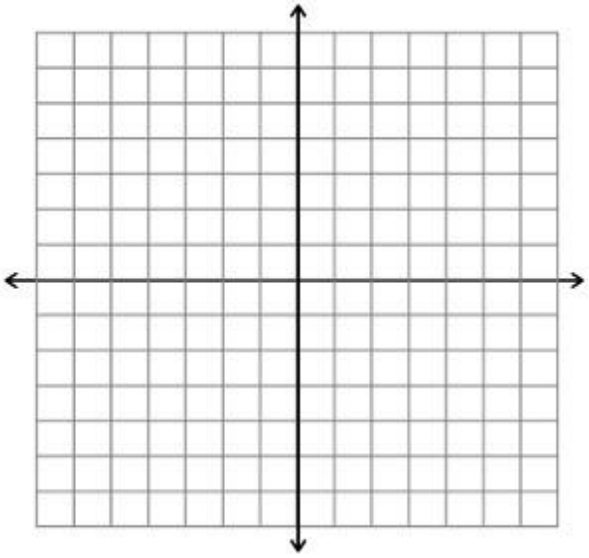


a) Standard Form:_____

b) Vertex:_____

c) Range:_____

EX5: $f(x) = 3x^2 - 12x + 9$

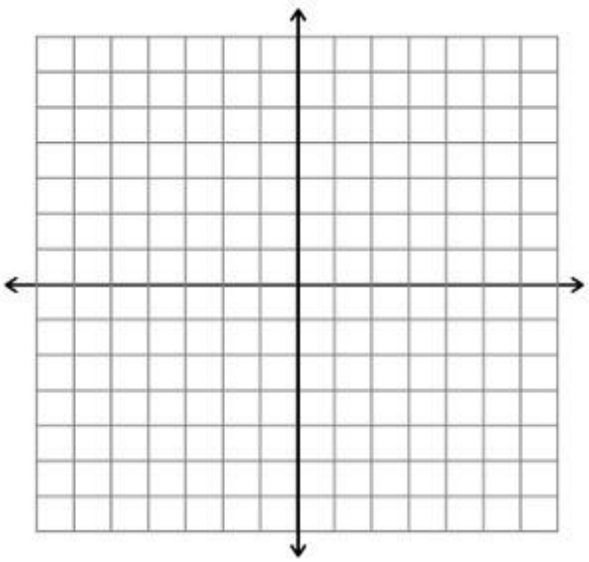


a) Standard Form:_____

b) Vertex:_____

c) Range:_____

EX6: $f(x) = 2x^2 - 10x + 8$



a) Standard Form:_____

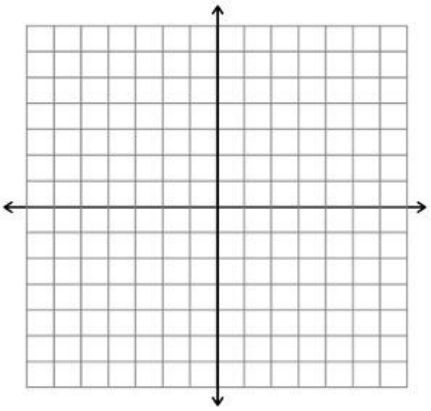
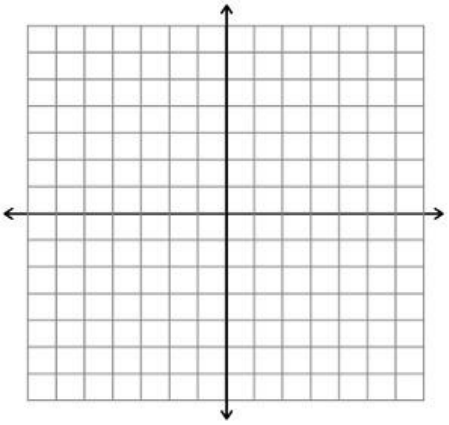
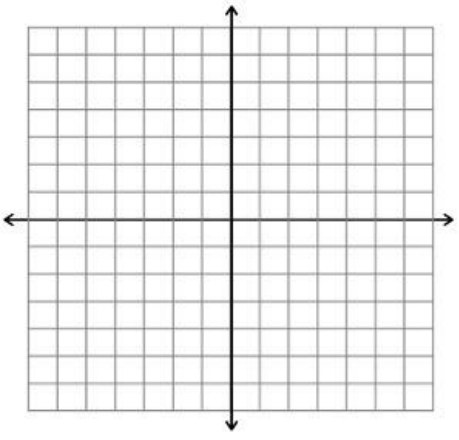
b) Vertex:_____

c) Range:_____

All parabolas have either a MAXIMUM VALUE or a MINIMUM VALUE.

- If the parabola opens up ($a > 0$ the parabola will have a minimum value at $y = k$.
- If the parabola opens down ($a < 0$ the parabola will have a maximum value at $y = k$.

Find the x intercepts and the min or max value of the following functions. Then graph the function.

EX7: $f(x) = -(x-2)^2 + 4$ 	a) X-int(s):_____ b) Min/Max value:_____
EX8: $f(x) = x^2 + 6x - 7$ 	a) X-int(s) :_____ b) Min/Max value: _____
EX9: $f(x) = 4x^2 + 12x + 9$ 	a) X-int(s) :_____ b) Min/Max value: _____