

## HW Questions

HW 1.6 #5)

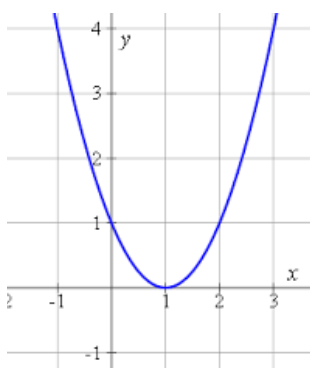
State the transformations from  $y = x^2$ .

$$y = (100 - x)^2$$

Sep 21-10:24 AM

## 2.1 Quadratic Functions

Objectives: 7) I can find the **vertex** of a quadratic function algebraically from **vertex form**.



8) I can find the **vertex** of a quadratic function algebraically from **standard form**.

9) I can find the **axis of symmetry** of a quadratic function.

10) I can use **completing the square** to change standard form to vertex form.

Oct 25-9:09 AM

## Quadratic Functions

Recall... aka remember... aka recollect...  
recognize... etc.

Domain changes  
Range changes

$$y = \pm a \left( \pm \frac{1}{b} x - h \right)^2 + k$$

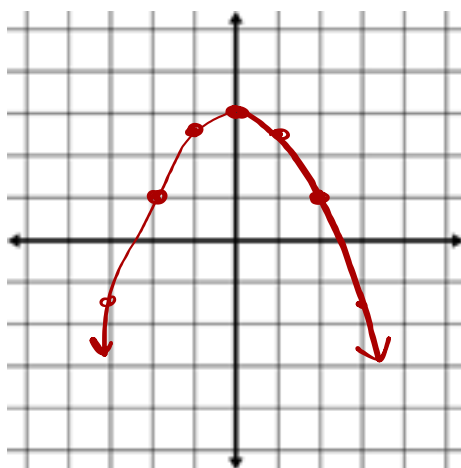
# DESMOS

Oct 25-9:48 AM

Describe the transformations, then sketch the graph.

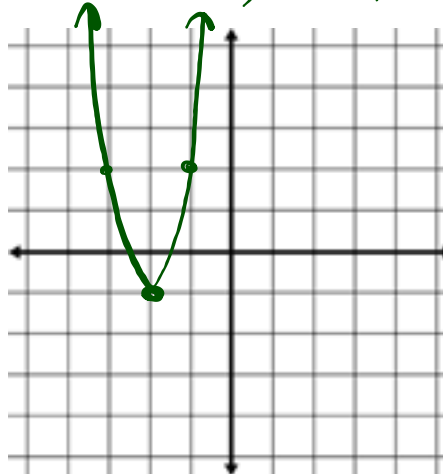
$$g(x) = -\frac{1}{2}x^2 + 3$$

Vert flip, vert str of  $\frac{1}{2}$ , up 3



$$h(x) = 3(x+2)^2 - 1$$

vert. str. of 3, left 2, down 1



Oct 25-10:08 AM

**Vertex:** The low or high point of the curve.  $(h,k)$

**Axis of Symmetry:** The line through the graph so that each side is the mirror image.  $x = h$

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**Ex.** Find the vertex and axis of symmetry of the functions.

$$g(x) = -\frac{1}{2}x^2 + 3$$

$h = 0$   
 $k = 3$   
 vertex:  $(0, 3)$   
 axis of sym:  $x = 0$

$$h(x) = 3(x+2)^2 - 1$$

$h = -2$   
 $k = -1$   
 vertex:  $(-2, -1)$   
 axis of sym:  $x = -2$

Oct 25-10:10 AM

### Standard Form and Vertex Form

$$f(x) = 3x^2 + 12x + 11 \quad h(x) = 3(x+2)^2 - 1$$

Changing to vertex form by **completing the square**.

**Ex.**

$$f(x) = x^2 + 12x + 11$$

$$f(x) = x^2 + 12x + \frac{36}{2} + 11 - \frac{36}{2}$$

$$\frac{12}{2} = 6 \quad 6^2 = 36$$

$$f(x) = (x^2 + 12x + 36) + 11 - 36$$

$$f(x) = (x+6)^2 - 25$$

**Ex.**

$$f(x) = x^2 + 6x + 7$$

$$f(x) = x^2 + 6x + \frac{9}{2} + 7 - \frac{9}{2}$$

$$\frac{6}{2} = 3 \quad 3^2 = 9$$

$$f(x) = (x^2 + 6x + 9) + 7 - 9$$

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

Oct 25-10:10 AM

Find the **vertex** and **axis of symmetry** for each function by changing the function to vertex form using completing the square.

$$f(x) = x^2 + 12x + 11$$

$$f(x) = (x+6)^2 - 25$$

vertex:  $(-6, -25)$

axis of sym:  $x = -6$

$$f(x) = x^2 + 6x + 7$$

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

vertex:  $(-3, -2)$

axis of sym:  $x = -3$

Sep 20-9:46 PM

Try completing the square for this one....hahahahaha....

$$f(x) = 3x^2 + 5x - 4$$

$$f(x) = 3(x^2 + \frac{5}{3}x) - 4$$

$$f(x) = 3(x^2 + \frac{5}{3}x + \underline{\quad}) - 4 - \underline{\quad}$$

$$\frac{5}{3} \div 2 \rightarrow \frac{5}{3} \cdot \frac{1}{2} = \frac{5}{6} \quad \left(\frac{5}{6}\right)^2 = \frac{25}{36}$$

$$f(x) = 3(x^2 + \frac{5}{3}x + \frac{25}{36}) - 4 - \frac{75}{36}$$

$$f(x) = 3(x + \frac{5}{6})^2 - \frac{219}{36}$$



$$3\left(\frac{25}{36}\right) = \frac{75}{36}$$

$$\frac{-144}{36} - \frac{75}{36} = \frac{-219}{36}$$

Sep 20-9:57 PM

Or....  $vertex = \left( \frac{-b}{2a}, f\left(\frac{-b}{2a}\right) \right)$



Sep 20-10:02 PM

$$f(x) = 3x^2 + 5x - 4$$

$\overset{a}{3}x^2 + \overset{b}{5}x - \overset{c}{4}$

$$\frac{-b}{2a} = \frac{-5}{2(3)} = \frac{-5}{6}$$

$$f\left(\frac{-5}{6}\right) = 3\left(\frac{-5}{6}\right)^2 + 5\left(\frac{-5}{6}\right) - 4$$

$$= 3\left(\frac{25}{36}\right) - \frac{25}{6} - 4$$

$$= \frac{75}{36} - \frac{150}{36} - \frac{144}{36}$$

$$= \frac{-219}{36}$$

$\left( \frac{-5}{6}, \frac{-219}{36} \right)$



Sep 20-10:10 PM

Find the vertex and axis of symmetry, then graph.

$$f(x) = 2x^2 - 5x + 3$$

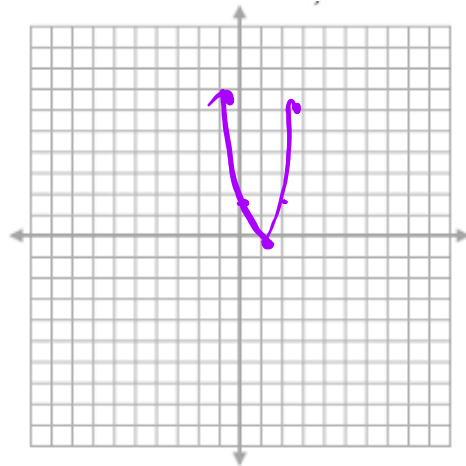
$$\frac{-b}{2a} = \frac{-(-5)}{2(2)} = \frac{5}{4}$$

$$f\left(\frac{5}{4}\right) = 2\left(\frac{5}{4}\right)^2 - 5\left(\frac{5}{4}\right) + 3$$

$$= 2\left(\frac{25}{16}\right) - \frac{25}{4} + 3$$

$$= \frac{50}{16} - \frac{100}{416} + \frac{48}{16}$$

$$= \frac{-2}{16} = -\frac{1}{8}$$



vertex:  $\left(\frac{5}{4}, -\frac{1}{8}\right)$

axis of sym:  $x = \frac{5}{4}$

Find the vertex and axis of symmetry, then graph.

$$f(x) = -2x^2 + 16x - 34$$

$$\frac{-b}{2a} = \frac{-16}{2(-2)} = \frac{-16}{-4} = 4$$

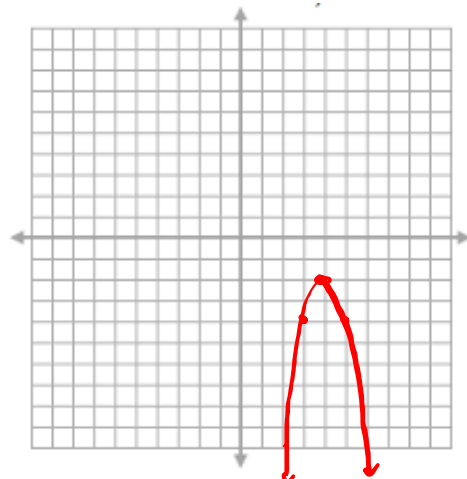
$$f(4) = -2(4)^2 + 16(4) - 34$$

$$= -32 + 64 - 34$$

$$= -2$$

vertex:  $(4, -2)$

axis of sym:  $x = 4$



Find the vertex and axis of symmetry, then graph.

$$f(x) = \overset{\text{vert stretch}}{3}x^2 - 12x + 7$$

$$\frac{-b}{2a} = \frac{-(-12)}{2(3)} = \frac{12}{6} = 2$$

$$f(2) = 3(2)^2 - 12(2) + 7$$

$$= 12 - 24 + 7$$

$$= -5$$

$$\text{vertex: } (2, -5)$$

$$\text{axis of sym: } x = 2$$

