10/19

Thursday, October 19, 2017 5:04 PM

Ex: $f(x) = 2x - 1$ Dom f: $(-\infty, \infty)$

$g(x) = x^2 + x - 3$ Dom g: $(-\infty, \infty)$

$$(f+g)(x) = f(x) + g(x) = 2x - 1 + (x^2 + x - 3)$$
$$= x^2 + 3x - 4$$

Dom: $(-\infty, \infty)$

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

Dom: $(-\infty, \infty)$

$$(f \cdot g)(x) = (2x-1) \cdot (x^2 + x - 3)$$
$$= 2x^3 + 2x^2 - 6x - x^2 - x + 3 = 2x^3 + x^2 - 7x + 3$$

Dom: $(-\infty, \infty)$

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

Dom: $2x - 1 \neq 0$

$2x \neq 1$

$x \neq 1/2$

$$\boxed{(-\infty, \tfrac{1}{2}) \cup (\tfrac{1}{2}, \infty)}$$

Section 3.1

vertical stretch

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vertical stretch

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

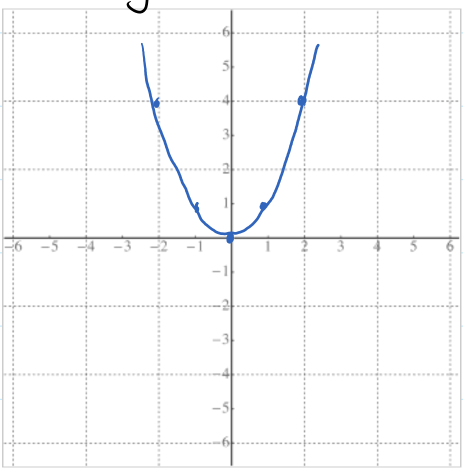
right   up

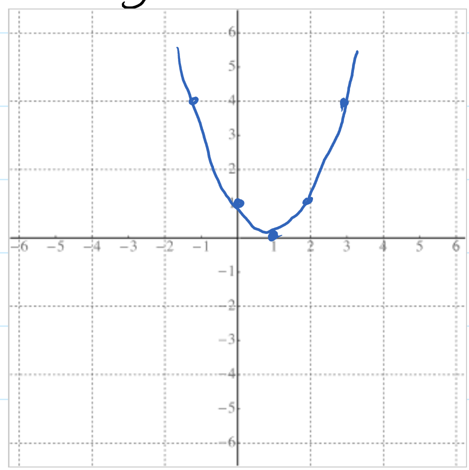
base: x^2

hor. shift to right

$y = x^2$

$y = (x-1)^2$



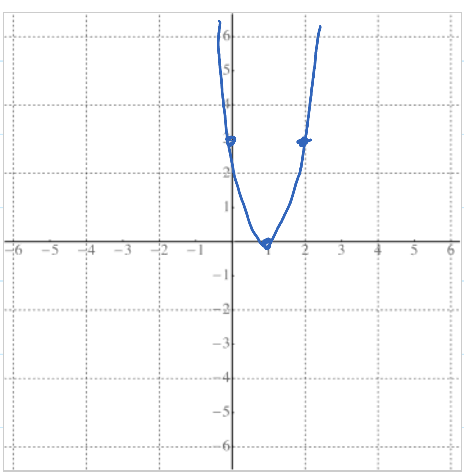


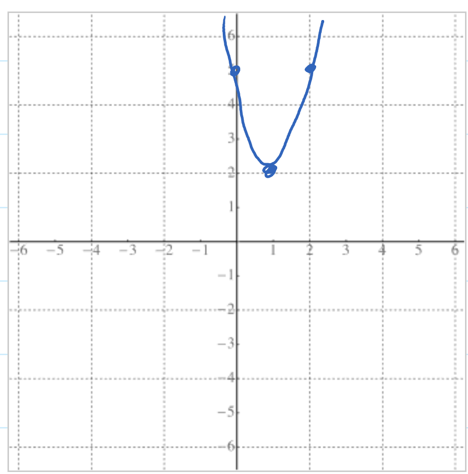
vertical stretch by fact. of 3

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

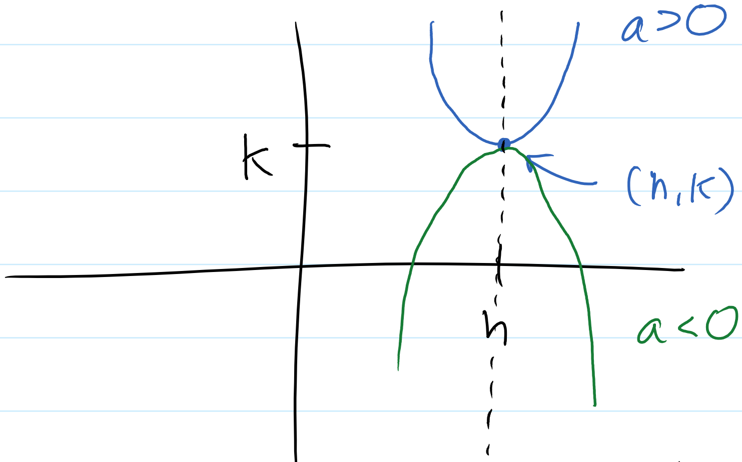
shift up by 2

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





A parabola $y = a(x-h)^2 + k$ has a vertex at (h, k):



$x = h \Leftrightarrow$ "axis of symmetry"

The general form of a quadratic function (prabola)

$$f(x) = ax^2 + bx + c,$$

the standard form of parabola is

$$a(x-h)^2 + k.$$

Ex: Find the general form of $f(x) = -2(x-3)^2 + 8$ and graph the porabola.

$$f(x) = -2(x-3)^2 + 8$$

foil $(a-b)^2 = a^2 - 2ab + b^2$

$$= -2(x^2 - 2 \cdot x \cdot 3 + 9) + 8$$

$$= -2x^2 + 12x - 18 + 8$$

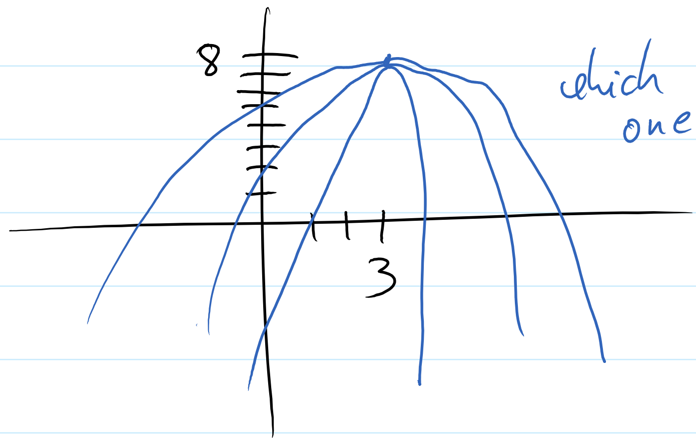
$= -2(x^2 - 6x + 9) + 8$

$= -2x^2 + 12x - 18 + 8$

$= -2x^2 + 12x - 10$

vertex: $(3, 8)$

open down



which one?

y-int: $(0, f(0))$

$f(0) = -2 \cdot 0 + 12 \cdot 0 - 10 = -10$

$\boxed{(0, -10)}$

x-int: $(?, 0)$

need to solve $\}$ $f(x) = 0$

$-2(x-3)^2 + 8 = 0$

$\dfrac{-2(x-3)^2}{-2} = \dfrac{-8}{-2}$

$(x-3)^2 = 4$

$x - 3 = \pm\sqrt{4}$

$x = 3 \pm 2 < \begin{matrix} x = 5 \\ x = 1 \end{matrix}$

$\boxed{(5,0), (1,0)}$

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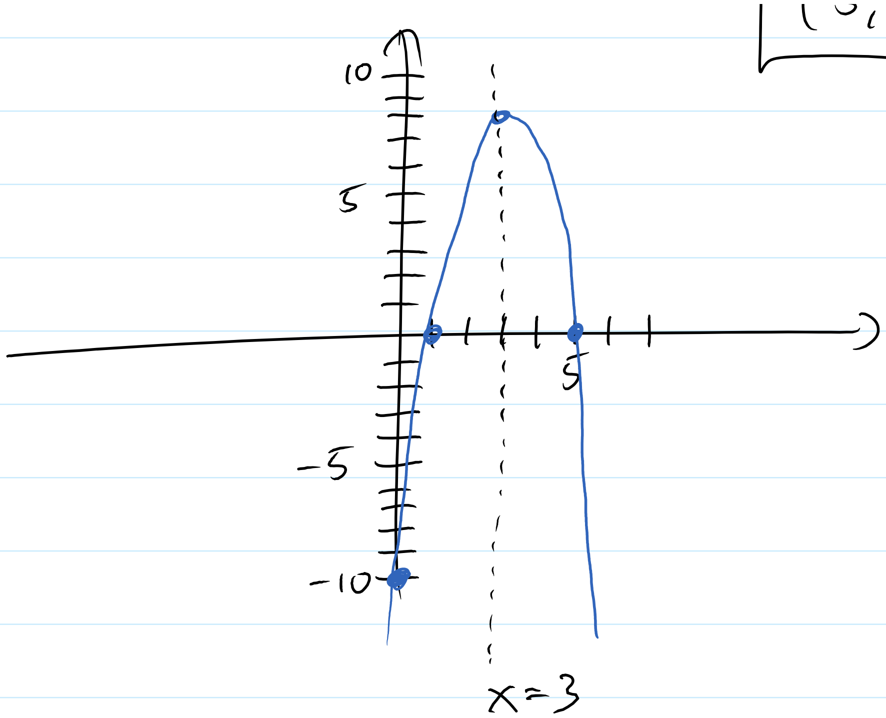


Plot: $f(x) = (x+3)^2 + 1$

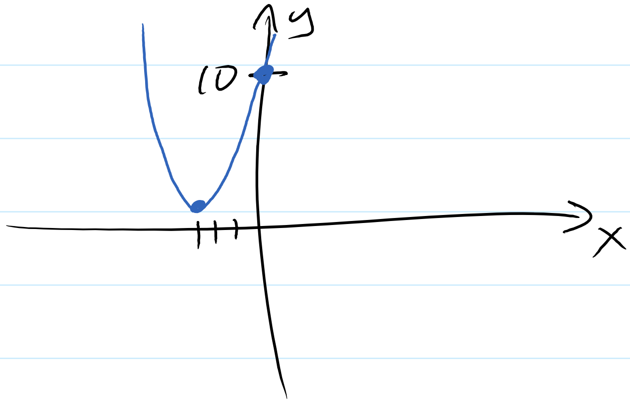
vertex: $(-3,1)$

axis of symmetry: $x=-3$

open: up

y-int: $f(0) = (0+3)^2 + 1 = 10$

$(0,10)$



<u>x-int:</u>

$(x+3)^2 + 1 = 0$

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

$x+3 = \pm\sqrt{-1}$

no real solutions

<u>no x-int</u>

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

Find the vertex:

<u>by formula:</u>

$$\frac{-b \pm \cancel{\sqrt{b^2-4ac}}}{2a}$$

x-coordinance: $\boxed{\frac{-b}{2a}}$

$$x = \frac{-(-2)}{2\cdot(-1)} = \frac{2}{-2} = -1$$

y-coord: evaluate $f(x)$ at $x = \frac{-b}{2a}$

$$f(-1) = -(-1)^2 - 2(-1) + 1$$
$$= -1 + 2 + 1$$
$$= 2$$

$$\boxed{\text{vertex: } (-1, 2)}$$

<u>complete the square:</u>

$$-(x^2 + 2x \quad -1)$$

add & subt: $\left(\frac{+2}{2}\right)^2 = 1^2 = 1$

$$-(x^2 + 2x + 1 - 1 \quad -1)$$

$$-(x^2 + 2x + 1) + 1 + 1$$
$$-(x+1)^2 + 2$$

$$\boxed{\text{vertex: } (-1, 2)}$$

<u>Ex:</u> Plot:

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

<u>vertex:</u> $x = \frac{-(-2)}{2\cdot 3} = \frac{2}{6} = \frac{1}{3}$

$$y = f\left(\tfrac{1}{3}\right) = 3\cdot\left(\tfrac{1}{3}\right)^2 - 2\left(\tfrac{1}{3}\right) - 4 = \frac{3}{1}\cdot\frac{1}{9} - \frac{2}{3} - 4$$

$$= \frac{1}{3} - \frac{2}{3} - \frac{12}{3} = \frac{-13}{3} \approx -4.33$$

$$\boxed{\left(\tfrac{1}{3}, \tfrac{-13}{3}\right)}$$

y-int: $f(0) = -4$ $\quad (0, -4)$

x-int: $\dfrac{2 \pm \sqrt{4 + 4\cdot 3\cdot 4}}{2\cdot 3} = \dfrac{2 \pm \sqrt{4 + 3\cdot 16}}{6}$

$$= \frac{2 \pm \sqrt{52}}{6} = \frac{2 \pm \sqrt{4\cdot 13}}{6} = \frac{2 \pm 2\sqrt{13}}{6}$$

$$= \frac{2(1 \pm \sqrt{13})}{6} = \frac{1 \pm \sqrt{13}}{3}$$