

Lesson 3 Vertical/Horizontal Translations

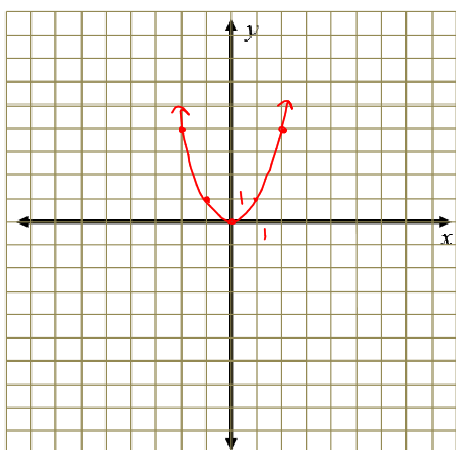
$y = (x - h)^2$ horizontal translation h units right/left

$x \ominus h$ right h units

$x \oplus h$ left h units

$y = x^2 + k$ vertical translation k units up/down

Recall: Basic parabola: Sketch $y = x^2$.



x	y
-2	4
-1	1
0	0
1	1
2	4

$ax^2 + bx + c = 0$ quad eqn
 $y = ax^2 + bx + c$ quad fcn

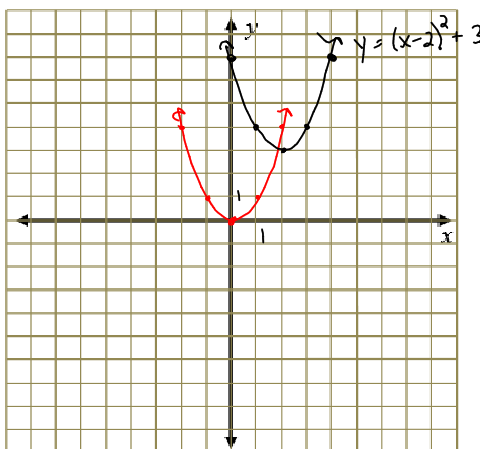
Example 1

Sketch the following graphs.

a.) $y = (x - 2)^2 + 3$

$h = 2$ right 2
 $k = 3$ up 3

$y = a(x-h)^2 + k$ ← standard form



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

On your mini whiteboard, sketch $y = -\frac{1}{4}x^2$.

Help each other and try to show anyone
who was away how to do it !!

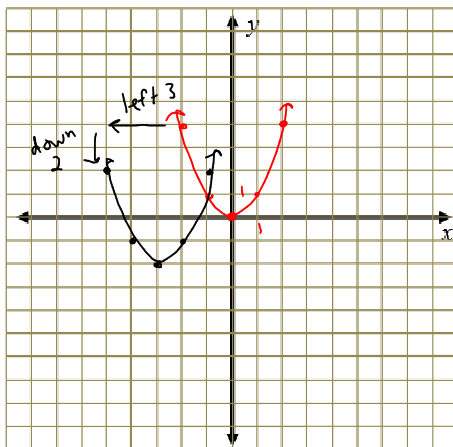
Pre-Calculus 11 Quadratic Functions

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

b.) $y = (x+3)^2 - 2$

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

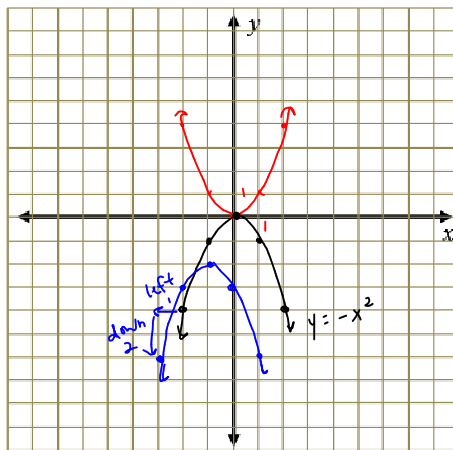
\uparrow
 $h = -3$
 left 3
 \uparrow
 $k = -2$
 down 2



c.) $y = -(x+1)^2 - 2$

\uparrow
 reflects
 (opens down)

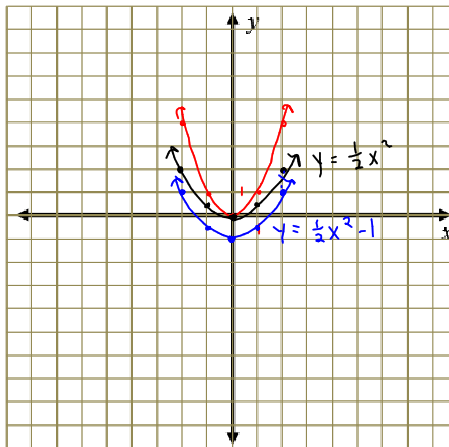
- ① $y = x^2$ ← basic graph
- ② $y = -x^2$ ← reflects multiply y-values by (-1)
- ③ $y = -(x+1)^2 - 2$
 \uparrow left 1 \uparrow down 2



Pre-Calculus 11 Quadratic Functions

d.) $y = \frac{1}{2}x^2 - 1$

- ① $y = x^2$
- ② $y = \frac{1}{2}x^2$ ← compresses mult y-value by $\frac{1}{2}$
- ③ $y = \frac{1}{2}x^2 - 1$ ← $k = -1$ move down 1

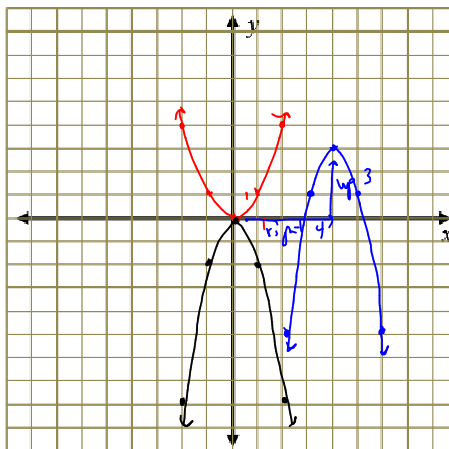


d.) $y = -2(x - 4)^2 + 3$

- ① $y = x^2$
- ② $y = -2x^2$ multiply y-values by (-2)
- ③ $y = -2(x - 4)^2 + 3$ right 4, up 3

x	y	$y = -2x^2$
-2	4	-8
-1	1	-2
0	0	0
1	1	-2
2	4	-8

plot



Exercise 3 Vertical/Horizontal Translations

1.) Sketch: (follow example 1)

a.) $y = (x - 1)^2 - 2$

b.) $y = (x + 4)^2 - 3$

c.) $y = -x^2 + 2$

d.) $y = 2(x + 1)^2$

e.) $y = -\frac{1}{2}(x - 3)^2 + 1$

2.) Solve: (follow QE L3, ex 1)

a.) $x^2 + x - 12 = 0$

b.) $(x + 1)(3x - 2) = 0$

3.) Solve: (follow QE L4, ex 2)

a.) $x^2 - 6x = 5$

b.) $x^2 + 14x - 1 = 0$

Extra Practice: Pg. 284 #4, 5, 8, 10a
