GSE Algebra 1 **7.6 – linear shifts** Name: _____

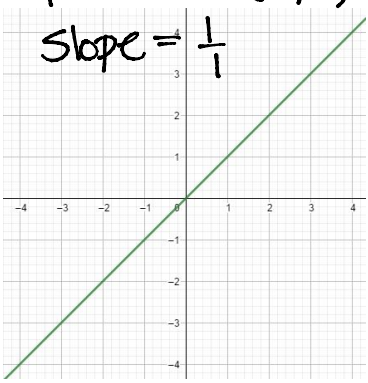
A line is going to shift very similar to a quadratic.

Let's look at what we have. lines have slope $y=a(x-h)+k$

$y = x$

PARENT GRAPH

x-int: (0,0) y-int: (0,0)

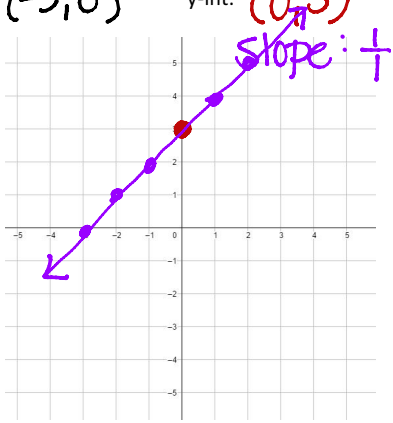


$y = x + 3$ → k

How do we move? up 3

$0=x+3$
$-3 \quad -3$
$x=-3$

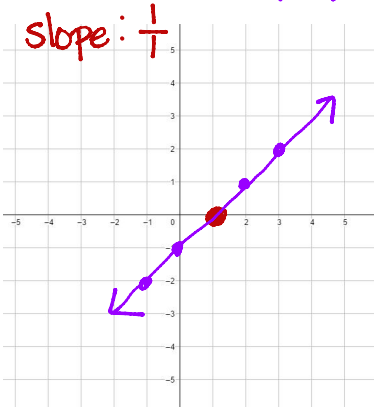
x-int: (-3,0) y-int: (0,3)



$y = (x - 1)$

How do we move? Right 1

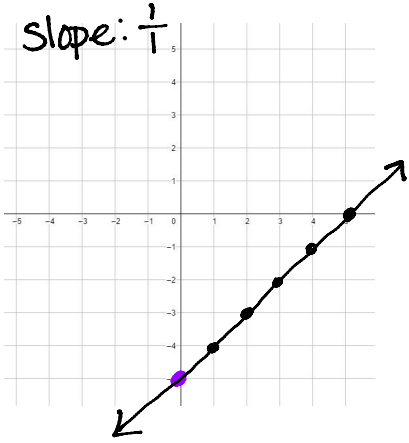
x-int: (1,0) y-int: (0,-1)



$y = x - 5$

How do we move? Down 5

x-int: (5,0) y-int: (0,-5)

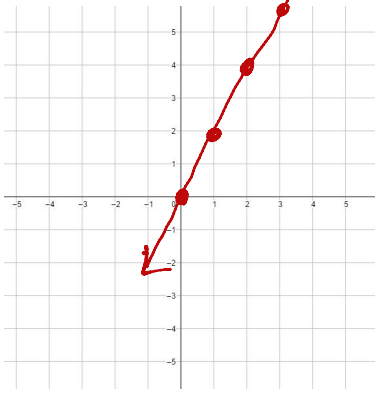


$y = 2x$

How do we move? Slope steeper : $\frac{2}{1}$

Vertical stretch

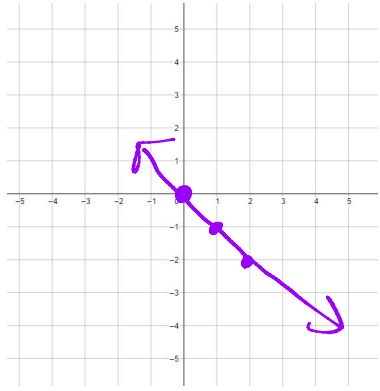
x-int: (0,0) y-int: (0,0)



$y = -x$ slope = $\frac{-1}{1}$

How do we move? Reflection over X-axis

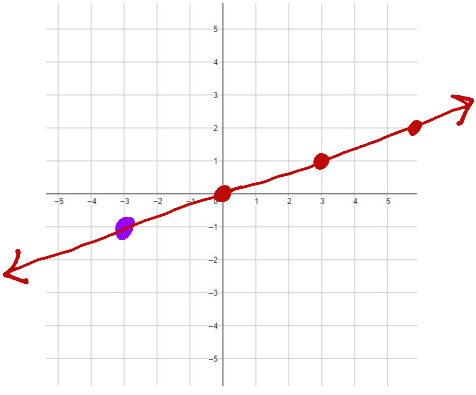
x-int: (0, 0) y-int: (0,0)



$y = \frac{1}{3}(x+3) - 1$ Slope: $\frac{1}{3}$

How do we move? Horiz. stretch | left 3 | Down 1

x-int: (0 ,0) y-int: (0 , 0)

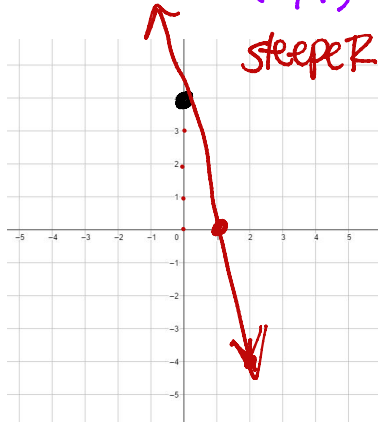


$y = -4x + 4$ Slope = $\frac{-4}{1}$

How do we move? Reflect | Vert stretch | up 4

x-int: (1,0) y-int: (0,4)

steeper



Compare linear to quadratics. How are these similar? How are they different?

Linear

$y = \frac{1}{2}(x+3)$

Slope: $\frac{1}{2}$ Horiz. stretch

left 3

Quadratic

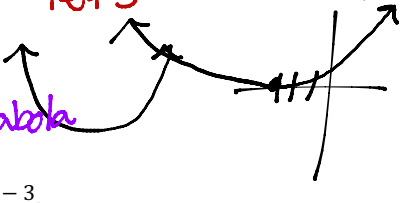
shifts same

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

Horiz stretch

left 3

Vertex (-3,0)



Quad- has vertex → parabola

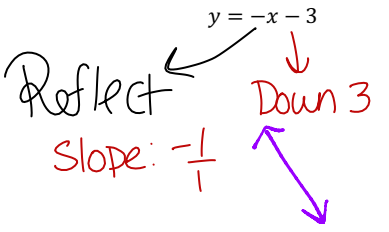
Line- no turning

$y = -x - 3$

Reflect

Down 3

Slope: $\frac{-1}{1}$

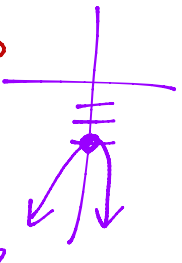


$y = -x^2 - 3$

Reflect

Down 3

Vertex (0, -3)



$y = 5(x+4) + 2$

Vert. stretch

left 4

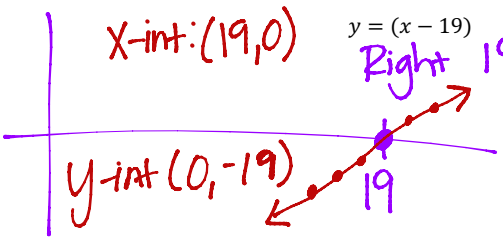
up 2

$y = 5(x+4)^2 + 2$ → up 2

Vert stretch

left 4

Vertex (-4, 2)



$y = (x-19)^2$

Right 19

Vertex (19,0)

1 x-intercept

19

What happens to a line when there is a number higher than 1 for a slope?

Vertical stretch → steeper → tall → skinny

What happens to a line when there is a number lower than 1 for a slope?

Horiz. stretch → Fatter → wider → Flatter

Write the equations for the following specific scenarios.

1) A quadratic that has been shifted 1 unit to the right and 5 units down.

$y = 1(x-1)^2 - 5$ → Standard $y = x^2 - 2x - 4$

Vertex

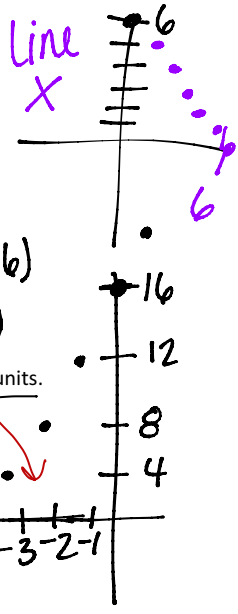
$(x-1)(x-1) - 5$

	x	-1
x	x^2	$-1x$
-1	$-1x$	1

$x^2 - 2x + 1 - 5$

Quadratic x^2

Line x



2) A line that has been reflected and moved up 6 units.

$y = -1x + 6$ y-int: $(0,6)$

X-int: $(6,0)$

3) A line that has been vertically stretched by a factor of 4 and moved left 4 units.

$y = 4(x+4)$ → $y = 4x + 16$ y-int: $(0,16)$

X-int: $(-4,0)$

4) A quadratic that has been reflected over the x-axis, vertically shrunk by ¼ and moved down 6 units.

x^2

$y = -\frac{1}{4}x^2 - 6$ Vertex $(0,-6)$

5) A quadratic that has been moved 4 units left and 9 units up.

$y = (x+4)^2 + 9$ Vertex $(-4,9)$ no x-ints

6) A line that has been translated 6 units right and 3 units down.

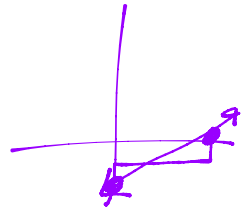
$y = (x-6) - 3$ → $y = x - 6 - 3 \Rightarrow y = x - 9$

x-int: $(9,0)$

y-int: $(0,-9)$

7) A quadratic that has been vertically stretched by a factor of 7 and moved 3 units right.

$y = 7(x-3)^2$ Vertex $(3,0)$



8) A line that has been horizontally stretched by $\frac{2}{3}$.

$y = \frac{2}{3}x$ Flat

9) A line that has been reflected, vertically stretched by a factor of 7 and down 9 units.

$y = -7x - 9$ y-int: $(0,-9)$

10) Quadratic: Horiz stretched by $\frac{1}{9}$

left 17 up 42

$y = \frac{1}{9}(x+17)^2 + 42$ Vertex $(-17,42)$

11) Line → Horiz stretched by $\frac{1}{3}$, right 9, up 3

$y = \frac{1}{3}(x-9) + 3$ → $\frac{1}{3}x - 3 + 3$

$y = \frac{1}{3}x$ y-int: $(0,0)$

X-int: $(0,0)$