Grab a computer - login and go to web browser to Desmos

GSE Algebra 1 **7.1 – Notes** Name: ____________________

The goal here to see what happens to parabolas as we move them around a graph, what happens in the equation and how that can affect the tables.

Let's look at quadratics again. What shape do they make? parabola

Match the correct statement to the description below.

Matching Equation (A, B, C, or D)	**Statement**		**Function Equation**
B	The length of each side of a square is increased by 5 units.	A	$A(x) = 5x^2$
C	The length of each side of a square is multiplied by 5 units.	B	$A(x) = (x+5)^2$
D	The area of a square is increased by 5 square units.	C	$A(x) = (5x)^2$
A	The area of a square is multiplied by 5.	D	$A(x) = x^2 + 5$

What is the **domain** of $y = x^2$? $(-\infty, \infty)$

PARENT FUNCTION: $y = x^2$

Let's look at how each part above changes the graph, equation and table.

$$y = x^2 + 5$$

How has this changed from the parent function $y = x^2$?

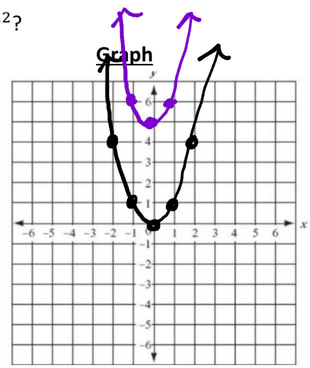
Equation

$y = x^2$	$y = x^2 + 5$
parent graph	Move up 5 units

Table +5

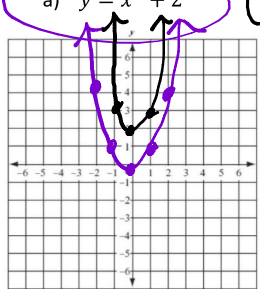
$y = x^2$		$y = x^2 + 5$	
x	y	x	y
-2	4	-2	9
-1	1	-1	6
0	0	0	5
1	1	1	6
2	4	2	9
3	9	3	14

Graph



Let's look at a few more. Try these two based off the work from above.

a) $y = x^2 + 2$ Up 2

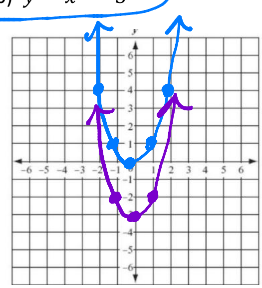


*So the number **OUTSIDE** of the parentheses*

(in the back of the equation) makes the

parabola move Up *or* Down

b) $y = x^2 - 3$ Down 3



Now let's try this one:

$x + \cancel{5} = 0$
$- \cancel{5} \quad -5$
$x = -5$

$y = (x+5)^2$

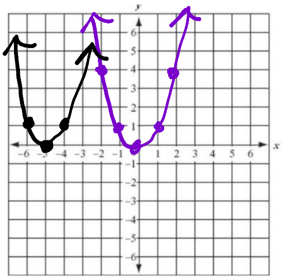
Equation

$y = x^2$	$y = (x+5)^2$
	Left 5

Table

$y = x^2$		$y = (x+5)^2$	
x	y	x	y
-2	4	-7	4
-1	1	-6	1
0	0	-5	0
1	1	-4	1
2	4	-3	4
3	9	-2	9

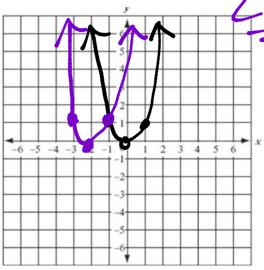
Graph



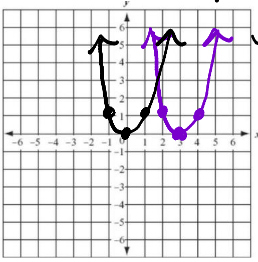
Let's look at a few more. Try these two based off the work from above.

*only inside ( )

a) $y = (x+2)^2$ 2 left



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



***So the number INSIDE of the parentheses (in the middle of the equation) makes the parabola move** left **or** Right*

*opposite of sign

Now this one:

$y = 5x^2$

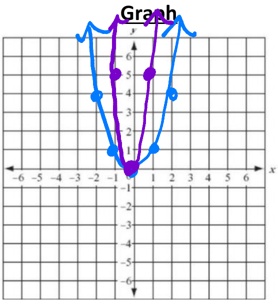
Equation

$y = x^2$	$y = 5x^2$
	Skinny *Vertical Stretch *Horizontal Compression

Table

$y = x^2$		$y = 5x^2$	
x	y	x	y
-2	4	-2	20
-1	1	-1	5
0	0	0	0
1	1	1	5
2	4	2	20
3	9	3	45

Graph



Now try these two:

a) $y = \frac{1}{4}x^2$

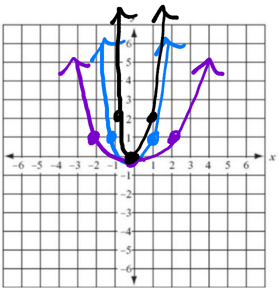
x	-2	-1	0	1	2	3
y	1	0.25	0	.25	1	2.25

fat

*Horizontal stretch

*Vertically compressed

$\frac{1}{4}(-2)^2$



b) $y = 2x^2$ skinny

x	-2	-1	0	1	2	3
y	8	2	0	2	8	18

*Vertical stretch

*Horiz. compression

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

*If your # in front greater than 1 → V. stretch

*If your # in front less than 1 (Fraction) → H. stretch

Let's look at what happens when the parabola is flipped upside down.

$$y = -x^2$$

Equation

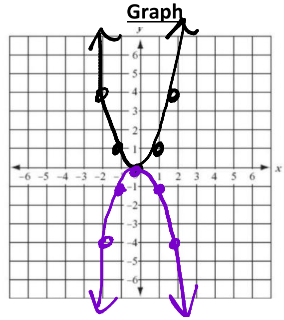
$y = x^2$	$y = -x^2$
	upside down

Reflection X-axis

Table

$y = x^2$		$y = -x^2$	
x	y	x	y
-2	4	-2	-4
-1	1	-1	-1
0	0	0	0
1	1	1	-1
2	4	2	-4
3	9	3	-9

Graph



So what happens when the number in **front** of the x^2 is **negative**?

This is called a Reflection over the x-axis.

Bringing it ALL together!

The vertex form of a quadratic is all of what you just did put together.

$$y = a(x-h)^2 + k \rightarrow$$ Vertex Form

Vertex: (h, k)

What does each part mean?

a	If **a** is **positive** Face up	If **a** is **negative** Reflect over X-axis	If **a > 1** $6x^2$ V. stretch H. compress.	If **0 < a < 1** $\frac{1}{3}x^2$ Horiz. stretch V. compress
h	If **h** is **positive** in the equation $*(x+7)^2$ left 7		If **h** is **negative** in the equation $*(x-4)^2$ Right 4	
k	If **k** is **positive** in the equation x^2+2 up 2		If **k** is **negative** in the equation x^2-14 Down 14	

Tell what has happened just based on the equation.

1) $y = 4(x-1)^2 + 3$ Vert stretch Right 1 up 3

2) $y = -(x+3)^2 - 2$ Reflection left 3 Down 2

3) $y = \frac{1}{3}x^2 - 3$ H. stretch V. compress Down 3

4) $y = -10(x+2)^2$ Reflection V. stretch left 2

Let's finish these from yesterday