Name: _____ Date: March 2 Hour: ____Alg 1____

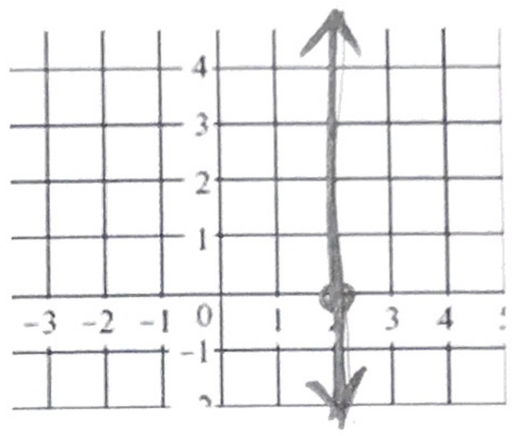
Unit 7A Day 1 and 2: Function Families

Focus Question: What families do I already know and which ones am I about to learn?

A. Review:

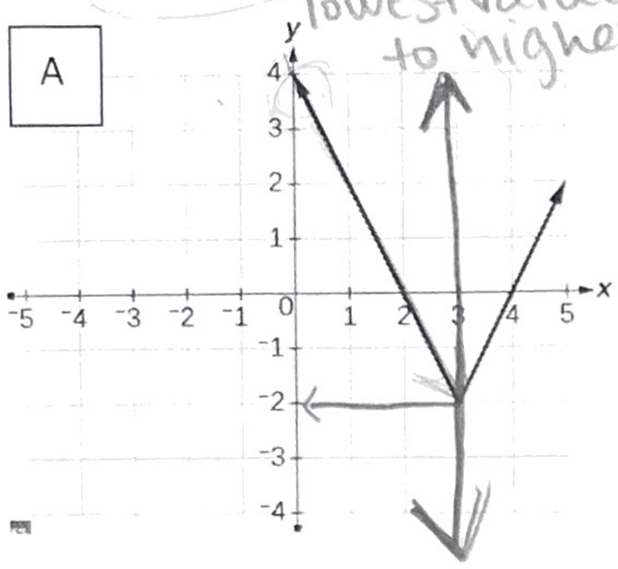
1. Change the following to function notation: $y = 4x - 6$ $f(x) = 4x - 6$

2. Graph $x = 2$ Not a function



3. Give the RANGE of the following graphs using interval notation.

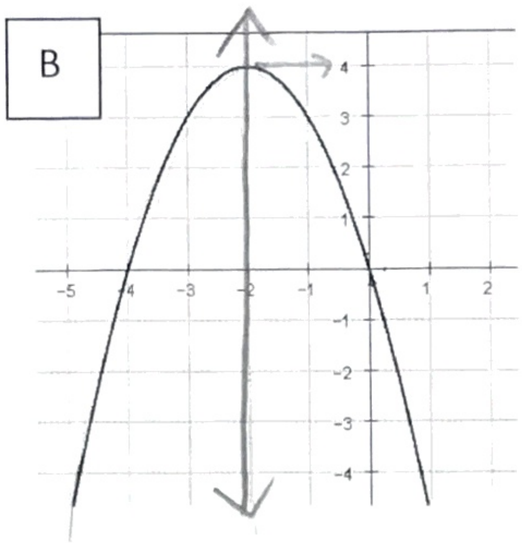
A



lowest value to highest

$[-2, \infty)$

B



$(-\infty, 4]$

4. Using the pictures above:

Graph B has a **maximum** because it has an actual highest #

Graph A has a **minimum** because it has an actual lowest #

The minimum and maximum are both called a vertex.

5. Give the intervals of increasing, decreasing, and constant for each graph.

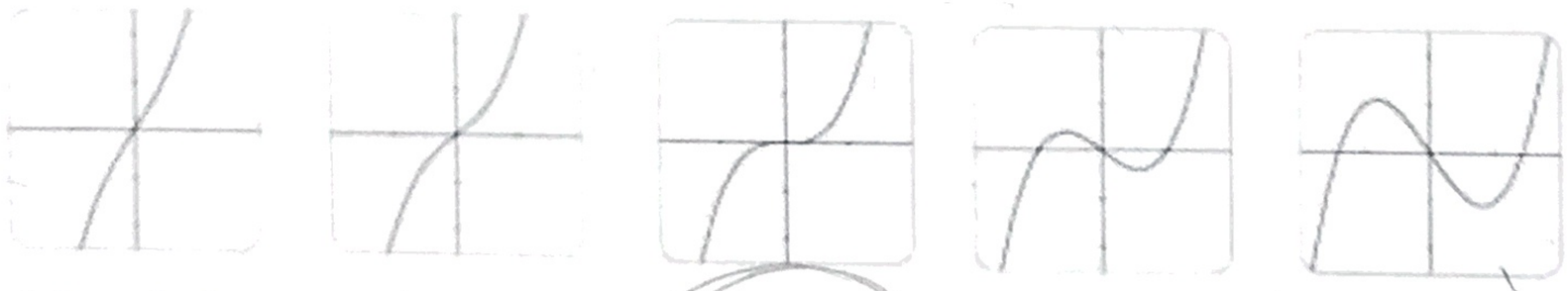
Dec. $(-\infty, 3)$ $(-\infty, -2)$ inc.
Inc. $(3, \infty)$ $(-2, \infty)$ decr.

The domain of each graph shows symmetry which means the graph can be folded along a vertical line. This is called an axis of symmetry

$x = 3$ $x = -2$ a.o.s.

B. Function Families

A **function family** is the group of functions that all have the same shape and degree in their equation. The graphs and equations below all belong to the cubic family (a family you learn in algebra 2).



(a) $y = x^3 + 2x$ (b) $y = x^3 + x$ (c) $y = x^3$ (d) $y = x^3 - x$ (e) $y = x^3 - 2x$

What do all of the "shapes" have in common? an "S" shape

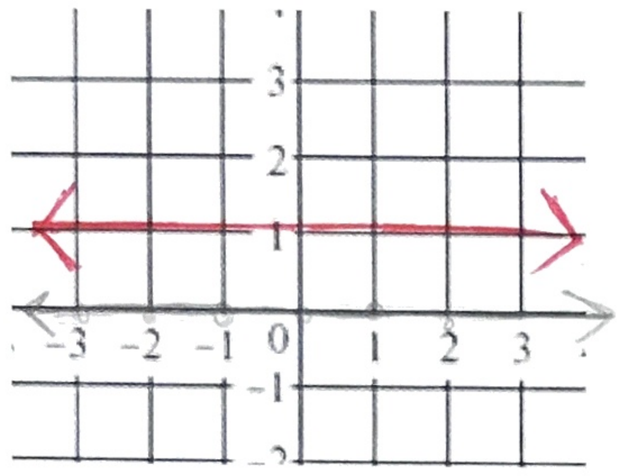
What do all of the equations have in common? x^3 (highest degree is 3)

The **parent function** for the family is the simplest function that meets the definition of that family. Which is the parent function of the cubic family?

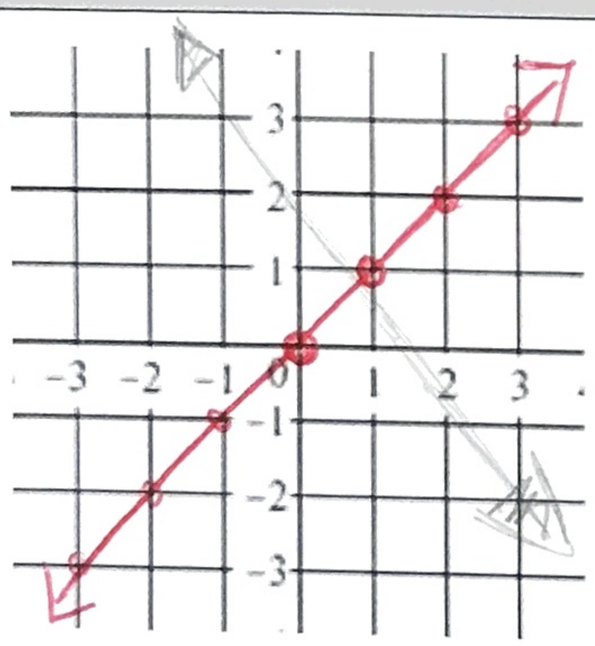
(C) its a monomial with coeffecient of 1

C. Families we know

For each family below, fill in the table. Remember that the parent function is not the only member of the family. You might need to think about other family members to correctly fill in the features.

Family Name	Parent Function	Shape	Domain	Range
Constant	**f(x) = 1**	horizontal line	$(-\infty, \infty)$	[#]
Graph		Increasing or Decreasing	Possible # of x intercepts (cross x axis)	Possible # of y intercepts
		Neither its always constant	None or ∞	1
		Vertex?	Axis of symmetry?	Generic Function is always written:
		No	Yes, ∞ many that are vertical	**f(x) =** #___
A constant table is distinguished by…		the y stays the same		

x	y
4	7
3	7
2	7
1	7

Family Name	Parent Function	Shape	Domain	Range
Linear	**f(x) = x**	Straight line	$(-\infty, \infty)$	$(-\infty, \infty)$
Graph		Increasing or Decreasing	Possible # of x intercepts	Possible # of y intercepts
		can incr. or decr. but not both @ same time	1	1
		Vertex?	Axis of symmetry?	Generic Function is always written:
		No	Yes ∞ many that are ⊥ to the line (slopes are opp. rec.)	**f(x) =** mx + b **but comes in other forms:** Stnd: Ax + By = C pt. slope: $y - y_1 = m(x - x_1)$
A linear table is distinguished by…		an additive pattern to both variables		

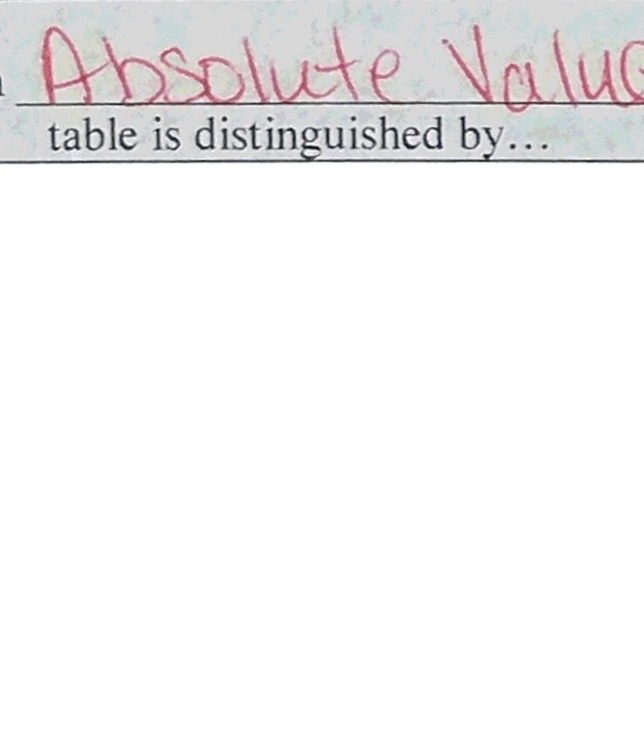
x	y
1	5
2	7
3	9
4	11

D. The Families we are about to learn in this unit

We have two more families to learn. We will fill in what we can today and come back and fill in more as we learn more. **Remember that the parent function is not the only member of the family. You might need to think about other family members to correctly fill in the features.**

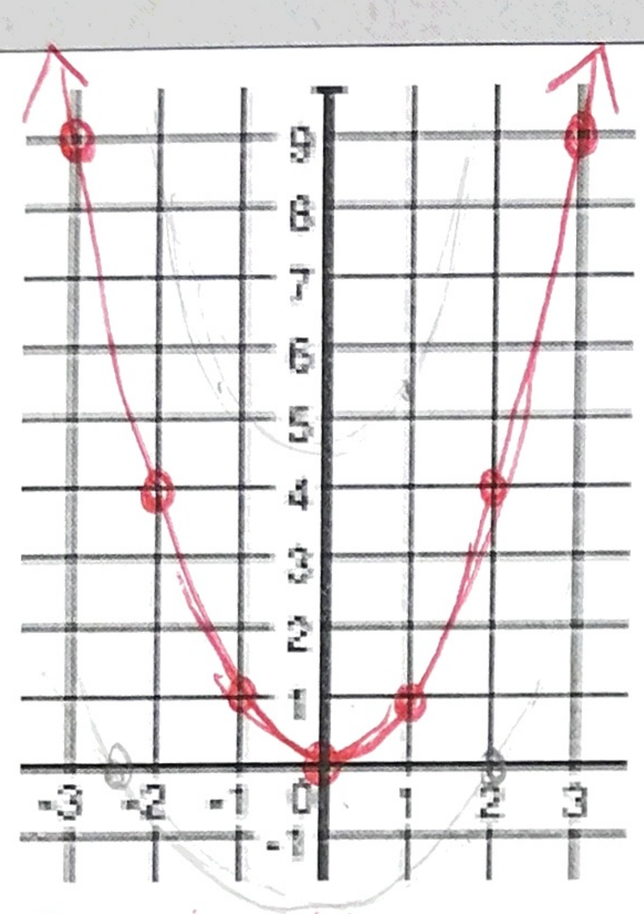
1. Absolute Value is the distance from zero. Since distance can never be negative, Absolute Value bars turns anything inside the Absolute Value bars positive.

x	-3	-2	-1	0	1	2	3
$\|x\|$	3	2	1	0	1	2	3

Family Name	Parent Function	Shape	Domain	Range
Absolute Value	$f(x) = \|x\|$	"V"	$(-\infty, \infty)$	$[0, \infty)$ limited by its Vertex
Graph		Increasing or Decreasing	Possible # of x intercepts	Possible # of y intercepts
		Always does both	1, 2, or 0	1
		Vertex?	Axis of symmetry?	Generic Function is always written:
		Yes!	Yes 1 Vertical through the Vertex	f(x) = _____
An Absolute Value table is distinguished by…				

2. The Quadratic Family

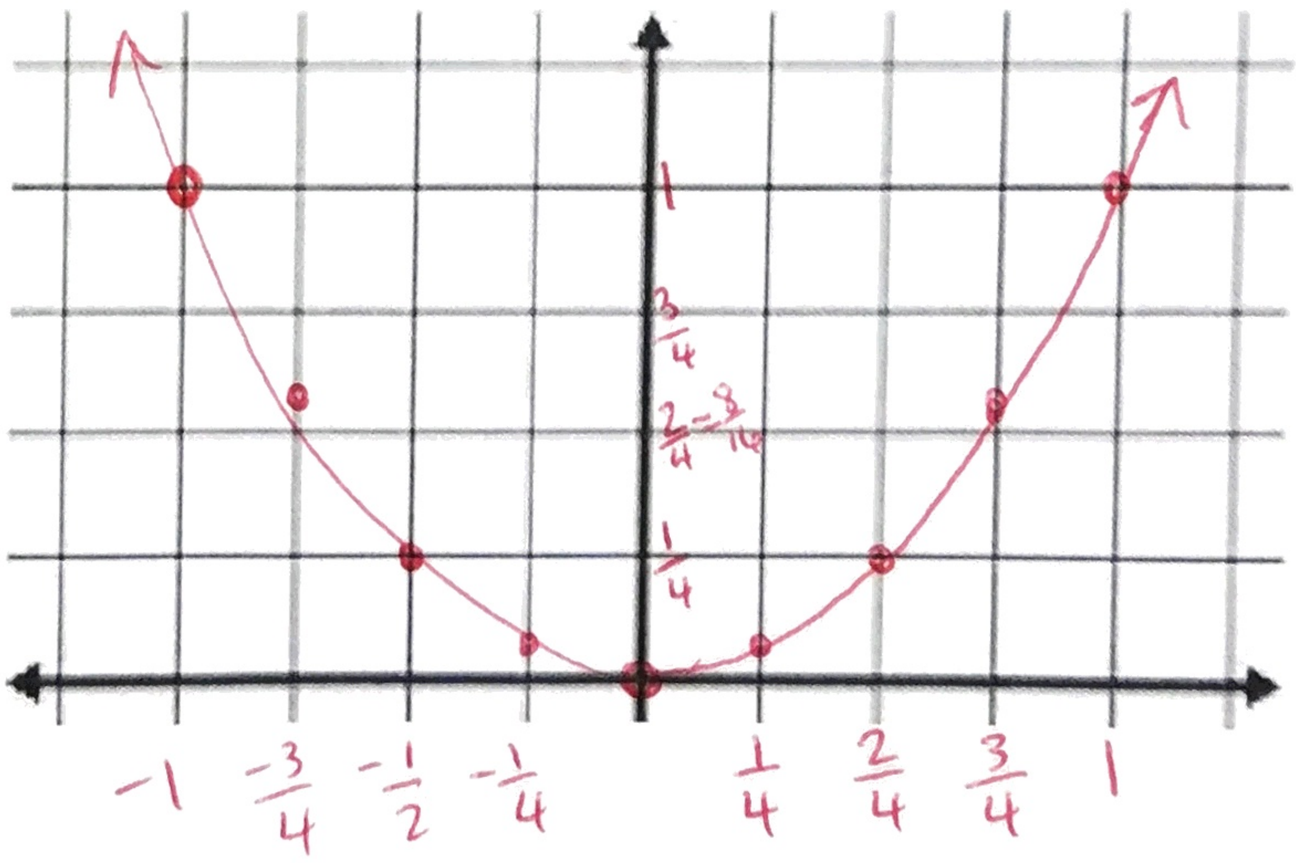
How do you say x^2? "x squared." And a square is a quadrilateral

Family Name	Parent Function	Shape	Domain	Range
Quadratic	$f(x) = x^2$ degree 2	"U" Parabola	$(-\infty, \infty)$	$[0, \infty)$ limited by its vertex
Graph		Increasing or Decreasing	Possible # of x intercepts	Possible # of y intercepts
		Both	1, 2, or 0	1
		Vertex?	Axis of symmetry?	Generic Function is always written:
		Yes.	1 vertical line through the vertex	**f(x) = _____ but comes in other forms:**
A Quadratic table is distinguished by…				

x	-3	-2	-1	0	1	2	3
f(x)	9	4	1	0	1	4	9

Is it pointed or curved at the bottom? Let's take a closer look…

x	f(x)
-1	1
-3/4	9/16
-1/2	1/4
-1/4	1/16
0	0
1/4	1/16
1/2	1/4
3/4	9/16
1	1



$(-\frac{3}{4})(-\frac{3}{4})$ $(-\frac{1}{2})(-\frac{1}{2})$

E. Comparing old families to new families

1. How many ways can you fill in the blank…
   All 4 families _____

- have 1 y intercept
- have domain $(-\infty, \infty)$
- have at least one a.o.s.

2. How many ways can you fill in the blanks…
   The two families we know _____ but these two new ones _____

- do not have a vertex
- can't inc AND dec in 1 pic.
- straight lines (1 directional)
- have ∞ a.o.s.

- do have a vertex
- do both (inc & dec) in same pic.
- change in directions
- have 1 a.o.s.

3. There is a similarity between only exponential and the two new families, it is there is a _____ to the _____.

F. Comparing Absolute Value and Quadratic functions

1. How many ways can you fill in the blank…
   Both Absolute Value and Quadratic functions _____

See above

and

- have a letter shape that is similar U and V
- limited range
- # of possible x int.

2. How many ways can you fil in the blanks…
   Absolute value functions _____ but quadratic functions _____

- Degree 1
- "Linear" V
- named Abs. value
- only 1 way to write the eq.

- Degree 2
- Curved U
- named Quadratic
- more than 1 way to write the eq.