Unit 4: Graphing Functions
Guided Notes

KEY

Name

Period

If found, please return to Mrs. Brandley's room, M-8.

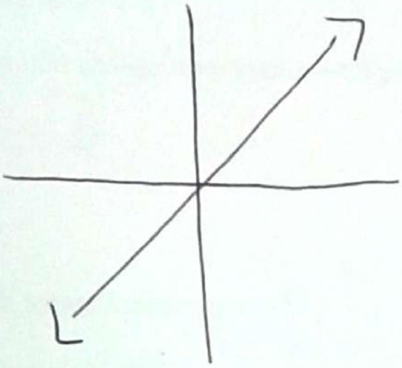
Concept 1: Graphs of Basic Functions

Graph the functions on your 4.1 assignment using the t-table provided then check your answer with your calculator:

(I won't make you graph them by hand forever but I want you to know how!)

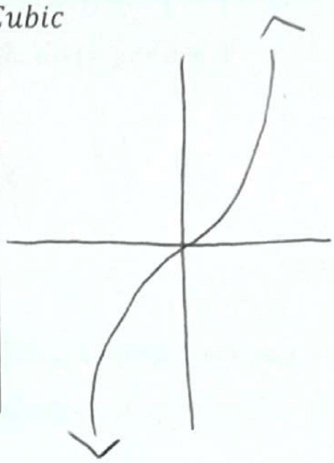
1. $y = x$ Linear

X	Y
3	3
2	2
1	1
0	0
-1	-1
-2	-2
-3	-3



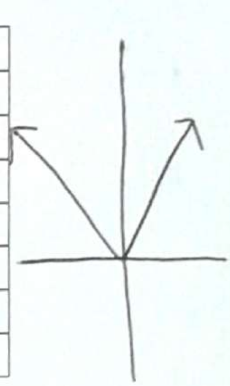
2. $f(x) = x^3$ *Cubic*

X	Y
3	27
2	8
1	1
0	0
-1	-1
-2	-8
-3	-27



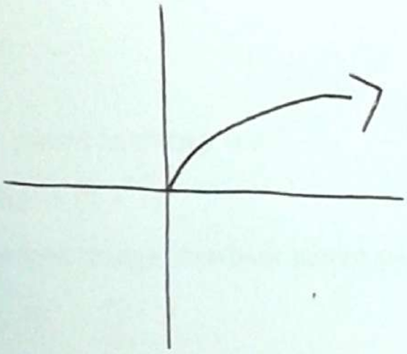
3. $y = |x|$ *AbsoluteValue*

X	Y
3	3
2	2
1	1
0	0
-1	1
-2	2
-3	3



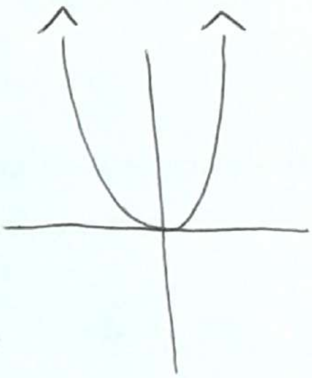
4. $f(x) = \sqrt{x}$ Root

X	Y
3	1.7
2	1.4
1	1
0	0
~~-1~~	
~~-2~~	
~~-3~~	



5. $f(x) = x^2$ Quadratic/Parabola

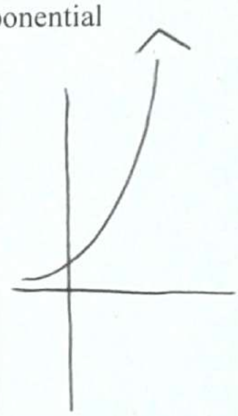
X	Y
3	9
2	4
1	1
0	0
-1	1
-2	4
-3	9



6. $y = a^x$ Exponential

2^x

X	Y
3	8
2	4
1	2
0	1
-1	1/2
-2	1/4
-3	1/8



These are the basic types of functions we will be discussing in this class. Every other function we look it will have one of these functions as their "base" function or "parent" function.

For the equations given below state what the parent function is from the 6 above:

1. $y = 3x^2 - 5$ Quadratic

2. $y = 7^x - 6$ Exponential

3. $y = 3x - 4$ Linear

4. $y = \sqrt{x+5}$ Root

2. $y = x^3 + 2$ Cubic

3. $y = 2|x - 5| + 4$ Absolute Value

How fast do exponential functions grow?

Compare the graphs of the following functions:

$y = x\^2$ $\qquad\qquad$ $y = 2^x$

Exponential functions grow at a much faster rate than any other Polynomial function.

Concept 2: Transformations of Graphs

As discussed yesterday, every graph we look at it in this class will be a transformation of one of the parent functions we looked at yesterday. Today we want to discover how those parent functions are transformed.

1. First: Graph parent function $y = x^2$

Second: Graph $y = x^2 + 3$

Third: Graph parent function $y = x$

Fourth: Graph $y = x + 4$

How did the graphs change from their parent graph?

up 3

up 4

2. First: Graph parent function $y = x^2$

Second: Graph $y = x^2 - 3$

Third: Graph parent function $y = |x|$

Fourth: Graph $y = |x| - 5$

How did the graphs change from their parent graph?

down 3

down 5

3. First: Graph parent function $y = x^2$

Second: Graph $y = (x + 2)^2$

Third: Graph parent function $y = 2^x$

Fourth Graph $y = 2^{x+4}$

How did the graphs change from their parent graph?

left 2

left 4

4. First: Graph parent function $y = x^2$

Second: Graph $y = (x - 2)^2$

Third: Graph parent graph $y = \sqrt{x}$

Fourth: Graph $y = \sqrt{x - 1}$

How did the graphs change from their parent graph?

right 2

right 1

5. First: Graph parent function $y = x^2$

Second: Graph $y = -x^2$

Third: Graph parent graph $y = x^3$

Fourth: Graph $y = -x^3$

How did the graphs change from their parent graph?

reflected over x-axis

6. First: Graph parent function $y = x^2$

Second: Graph $y = (-x)^2$

Third: Graph parent graph $y = x^3$

Fourth: Graph $y = (-x)^3$

How did the graphs change from their parent graph?

reflected over y-axis

7. First: Graph parent function $y = x^2$

Second: Graph $y = 2x^2$

Third: Graph parent function $y = x$

Fourth: Graph $y = 4x$

How did the graphs change from their parent graph?

stretched vertically

8. First: Graph parent function $y = x^2$

Second: Graph $y = \frac{1}{2}x^2$

Third: Graph parent function $y = x$

Fourth: Graph $y = \frac{1}{3}x$

How did the graphs change from their parent graph?

compressed vertically

9. First: Graph $y = (x-1)^2$

Second: Graph $y = (2x-1)^2$

Third: Graph parent function $y = |x|$

Fourth: Graph $y = |3x|$

How did the graphs change from their parent graph?

compressed horizontally

10. First: Graph $y = (x+1)^2$

Second: Graph $y = (\frac{1}{2}x+1)^2$

Third: Graph parent function $y = |x|$

Fourth: Graph $y = |\frac{1}{3}x|$

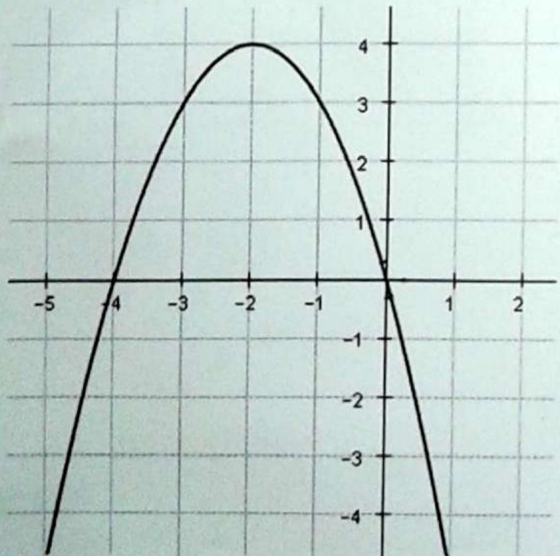
How did the graphs change from their parent graph?

stretched horizontally

Based on what you discovered through the previous activity, fill out the table below:

Function Notation	**Description of Transformation**
$f(x) = f(x) + c$	up c
$f(x) = f(x) - c$	down c
$f(x) = f(x + c)$	left c
$f(x) = f(x - c)$	right c
$f(x) = -f(x)$	Flipped over x-axis
$f(x) = f(-x)$	Flipped over y-axis
$f(x) = c * f(x)$	Stretched vertically
$f(x) = \frac{1}{c} * f(x)$	compressed vertically
$f(x) = f(cx)$	compressed horizontally
$f(x) = f\left(\frac{1}{c}x\right)$	stretched horizontally

Identify the transformations in the graph and equations below:



left 2, up 4, flipped over x-axis

$y = 2(x - 1)^2 + 5$

right 1
up 5
Stretched vertically by 2

$y = \left(\frac{1}{2}x + 2\right) - 4$

left 2
down 4
stretched horizontally by 1/2

$y = -\frac{1}{3}(x + 1)^2 + 7$

left 1
up 7
compressed vertically by $\frac{1}{3}$
Flipped over x-axis

~~Even: Even powers w/ a vertical symmetry~~
~~Odd: odd powers w/ no vertical symmetry~~

Concept 3: Key Features of Graphs

Define the following:

Increasing Intervals: intervals where graph has a positive rate of change

Decreasing Intervals: intervals where graph has a negative rate of change

Positive Intervals: intervals where the graph is above the x-axis

Negative Intervals: intervals where the graph is below the x-axis

X-Intercepts: points where graph passes x-axis

Y-Intercepts: points where graph crosses y-axis

Maximum (relative): points where rate of change goes from + to -

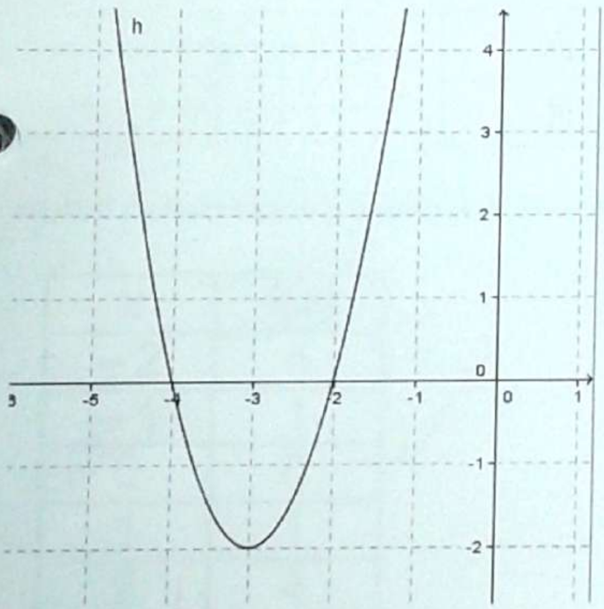
Minimum (relative): points where rate of change goes from - to +

Symmetries: vertical line that the graph is symmetric about

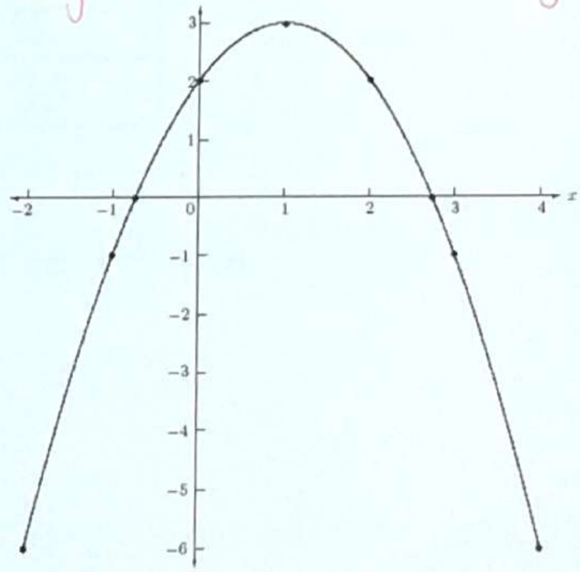
End Behavior: what y approaches as x approaches $-\infty$ & ∞

Identify each of the above in the graphs given below:

Even: symmetric about y-axis
odd: symmetric about origin



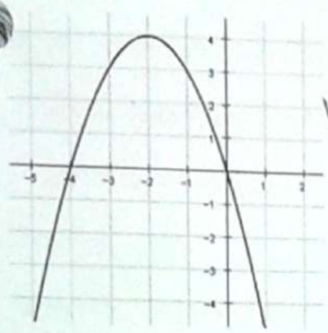
II: $[-3, \infty)$
DI: $(-\infty, -3]$
PI: $(-\infty, -4)$ $(-2, \infty)$
NI: $(-4, -2)$
XI: $(-4, 0)$ $(-2, 0)$
YI: N/A
Max: N/A
Min: $(-3, -2)$
Sym: Even $x = -3$
EB: As $x \to -\infty$, $y \to \infty$, As $x \to \infty$, $y \to \infty$



II: $(-\infty, 1)$
DI: $(1, \infty)$
PI: $(-1, 3)$
NI: $(-\infty, -1)$ $(3, \infty)$
XI: $(-1, 0)$ $(3, 0)$
YI: $(0, 2)$
Max: $(1, 3)$
Min: N/A
SYM: Even $x = 1$
EB: As $x \to -\infty$, $y \to -\infty$ As $x \to \infty$, $y \to -\infty$

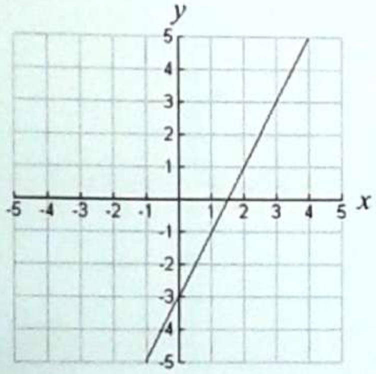
Concept 4: Comparing Graphs of Functions

Which of the following two quadratic functions has the larger maximum?



$$y = -x^2 + 2$$

Which of the following two functions has the greater rate of change?



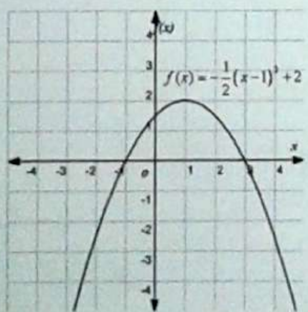
x	y
0	3
2	11
4	19
6	27
8	35

Which of the following two functions has the lower minimum?

x	f(x)
– 2	4
– 1	1
0	0
1	1
2	4

$$y = x^2 + 4$$

Which of the following two functions has an intercept at y=3?



$$y = x^2 - 1$$

Concept 5: Inverse Functions

Inverse Function: An inverse functions has all the same points as the original function, except the x-values and y-values of each point have been switched.

Find the inverse of the following functions:

1. f(x)={(0,3),(5,4),(8,9)}

f'(x)= {(3,0), (4,5), (9,8)}

2. f(x)={(0,5),(5,7),(8,3)}

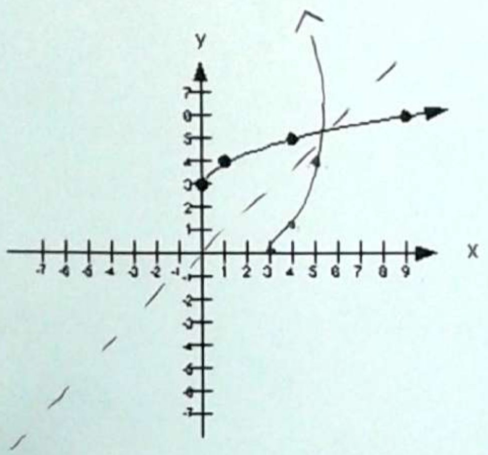
f'(x)= {(5,0), (7,5), (3,8)}

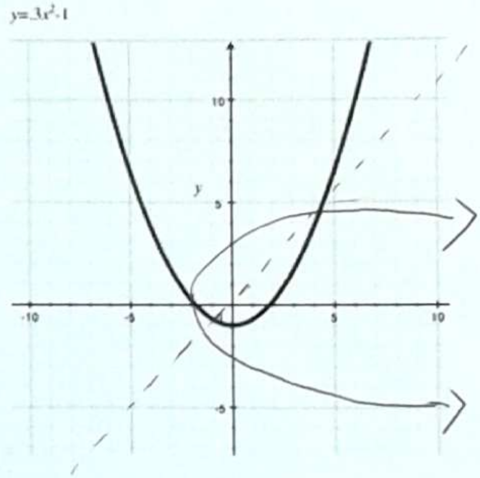
3. f(x)= {(1,6),(7,4),(2,3)}

f'(x)= {(6,1), (4,7), (3,2)}

Graph the inverse of the following functions:

(Either by switching the x and y values of each point, or reflecting the graph over the line y=x)





Find the inverse of the following functions:

(Switch x and y (or f(x)), then solve for y (or f(x))

$f(x) = x + 3$

$x = y + 3$

$y = x - 3$

$f'(x) = x - 3$

$f(x) = x^2 + 2$

$x = y^2 + 2$

$x - 2 = y^2$

$\sqrt{x-2} = y$

$f'(x) = \sqrt{x-2}$

$f(x) = \sqrt{x-1}$

$x = \sqrt{y-1}$

$x^2 = y - 1$

$x^2 + 1 = y$

$f'(x) = x^2 + 1$

$f(x) = x^3$

$x = y^3$

$\sqrt[3]{x} = y$

$f'(x) = \sqrt[3]{x}$

$f(x) = x^2 - 5$

$x = y^2 - 5$

$x + 5 = y^2$

$\sqrt{x+5} = y$

$f'(x) = \sqrt{x+5}$

$f(x) = (x + 2)^2 + 4$

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

$x - 4 = (y+2)^2$

$\sqrt{x-4} = y + 2$

$\sqrt{x-4} - 2 = y$

$f'(x) = \sqrt{x-4} - 2$