Date: **Section:** 1.5

Objective: Draw graphs with one transformation applied to a square root function, quadratic function, or absolute value function. Figure out the equation of a function from its graph.

Applying Transformations

1. **Identify the parent graph ($y=|x|$, $y=x^2$, or $y=\sqrt{x}$). (Does the equation have $|\ |$, ^{2}, or $\sqrt{\ }$?)**
2. **Fill in the x, y table for the parent graph.**
3. **Draw the graph of the parent graph with a dashed line.**
4. **Identify the transformation.**
5. **Fill in the new x, y table by adjusting the coordinates based on the transformation.**
6. **Draw the final graph with a solid line.**

Vertical Reflection:

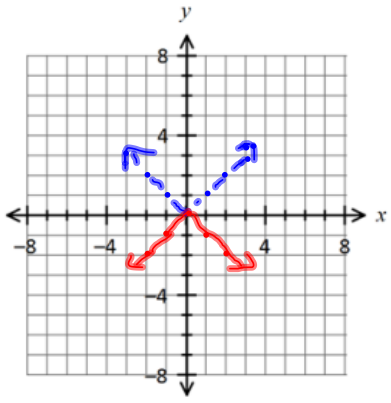
★ **Change the signs on the parent graph y's (multiply them by – 1).**

1. $y=-|x|$ when there is a negative in front multiple the y value by -1

Parent Graph: $y=|x|$ Transformation: reflect over x axis

x	y
–2	2
–1	1
0	0
1	1
2	2

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



calculator
press y =
press Math button *then arrow over* to NUM
1: abs(*select number 1 or press enter*
press the X, T, ~~Θ~~, n button *to insert an x*
press)

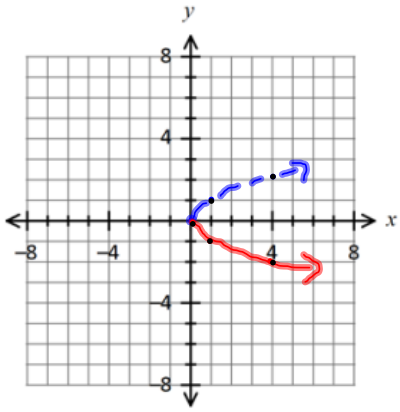
to get the table
push 2nd button then the GRAPH button
a table should appear

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

Parent Graph: $y = \sqrt{x}$ Transformation: flip(reflect) over the x axis

x	y
0	0
1	1
4	2

x	y
0	0
1	-1
4	-2



transformation-
multiple the y values from the parent graph by -1
to get the y values for the transformation

Vertical Stretch/Compression:

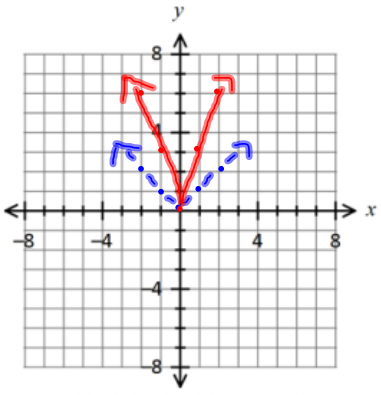
★ **Multiply the parent graph *y*'s by the number at the front of the equation.**

3. $y = 3|x|$

Parent Graph: $y = |x|$ Transformation: vertical stretch by 3

x	y
–2	2
–1	1
0	0
1	1
2	2

x	y
-2	6
-1	3
0	0
1	3
2	6



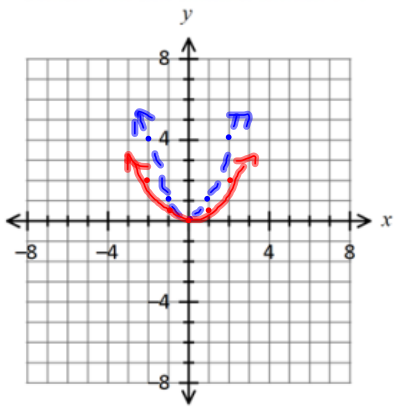
transformation
multiple the y values from the parent graph by 3 for
the transformation

4. $f(x) = \frac{1}{2}x^2$

Parent Graph: $y = x^2$ Transformation: vertical shrink by 1/2 or .5

x	y
–2	4
–1	1
0	0
1	1
2	4

x	y
-2	2
-1	.5
0	0
1	.5
2	2



transformation-
divide the y values from the parent graph by 1/2 to get the y values for the transformation table

Vertical Translation:

★ **Add or subtract the number at the end of the equation to the parent graph *y*'s. Use the SAME sign that the equation has.**

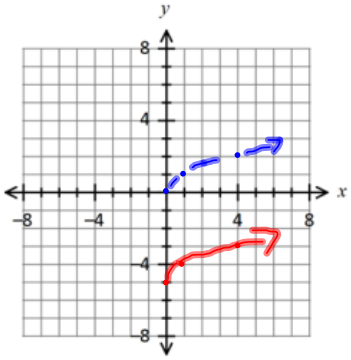
- **Example:** If the equation has a +6 at the end, add 6 to the *y*'s (graph moves *up* 6).
- **Example:** If the equation has a –3 at the end, subtract 3 from the *y*'s (graph moves *down* 3).

5. $f(x) = \sqrt{x} - 5$

Parent Graph: $y = \sqrt{x}$ Transformation: down 5

x	y
0	0
1	1
4	2

x	y
0	-5
1	-4
4	-3



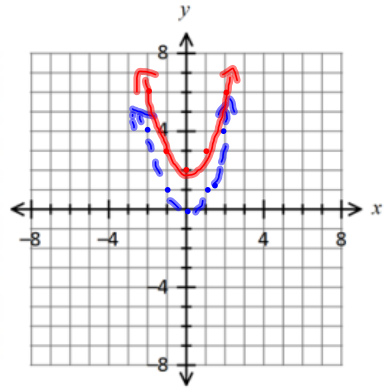
subtract 5 from the y values on the parent graph

6. $y = x^2 + 2$

Parent Graph: $y = x^2$ Transformation: move it up 2

x	y
–2	4
–1	1
0	0
1	1
2	4

x	y
-2	6
-1	3
0	2
1	3
2	6



Horizontal Translation:

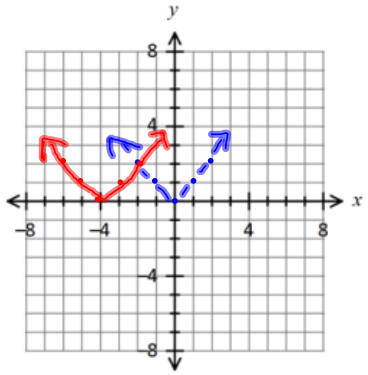
- ★ **Change the parent graph x's by doing the OPPOSITE of the $(x \pm \#)$ part of the equation.**
  - **Example:** If the equation has an $x+5$, *subtract* 5 from the x's (graph moves *left* 5).
  - **Example:** If the equation has an $x-1$, *add* 1 to the x's (graph moves *right* 1).

7. $y = |x+4|$

Parent Graph: $y = |x|$ Transformation: moves it left 4

x	y
–2	2
–1	1
0	0
1	1
2	2

x	y
-6	2
-5	1
-4	0
-3	1
-2	2

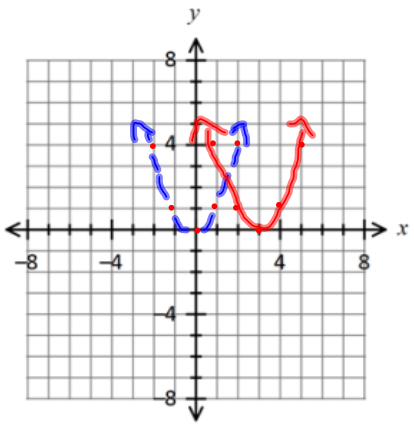


8. $f(x)=(x-3)^2$

Parent Graph: $y=x^2$ Transformation: move it to the right 3

x	y
−2	4
−1	1
0	0
1	1
2	4

x	y
1	4
2	1
3	0
4	1
5	4

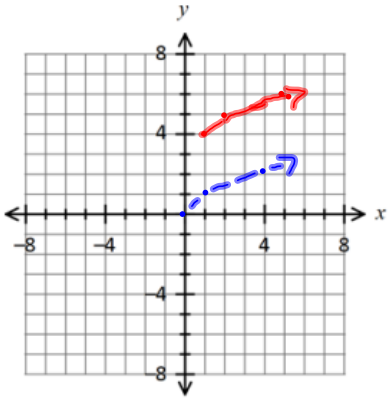


9. $f(x)=\sqrt{x-1}+4$

Parent Graph: $y=\sqrt{x}$ Transformation: two transformations moves up four right 1

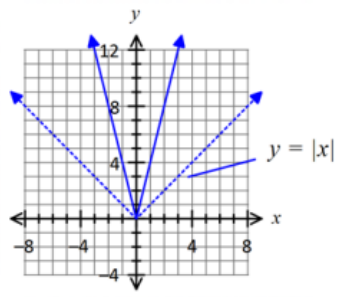
x	y
0	0
1	1
4	2

x	y
1	4
2	5
5	6



On each graph, the parent graph is shown as a dashed line, and a transformed graph is shown as a solid line. Determine what transformation of the parent graph was performed and write an equation of the final graph.

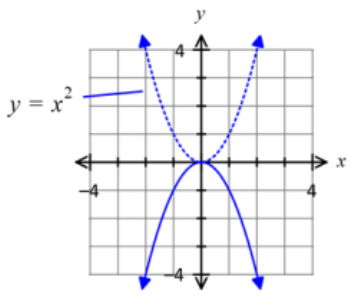
10.



Transformation: vertical stretch by 4

Equation: y = 4|x|

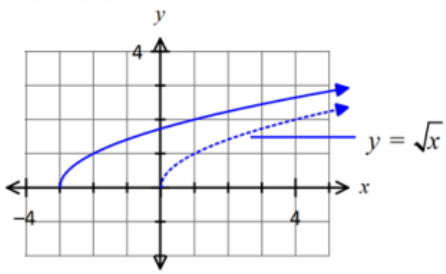
11.



Transformation: flip over x axis

Equation: y = - x²

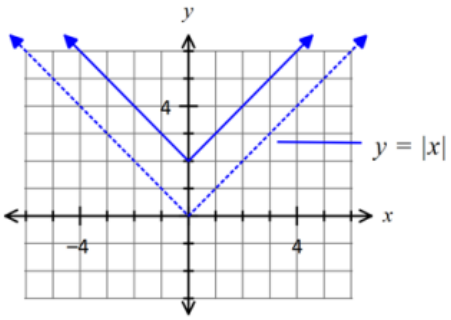
12.



Transformation: left by 3

Equation: y = √(x+3)

13.



Transformation: up 2

Equation: y = |x| + 2