Use the key features to write a model for the parabola using your observations from the last example.

**Part 2: More Parent Graphs**

In Unit 4: Structures of Expressions, you studied transformations of quadratic functions. Describe what happens to the quadratic parent graph $y = x^2$ for each of the following transformations:

$y = x^2 + k$, where $k > 0$ greater than 0

up by k

$y = x^2 - k$, where $k > 0$

Down by k

$y = (x + k)^2$, where $k > 0$

Left by k

$y = (x - k)^2$, where $k > 0$

Right by k

$y = k \cdot x^2$, where $0 < k < 1$

compress by k

$y = k \cdot x^2$, where $k > 1$

stretch by k

$y = k \cdot x^2$ , where *k* is a negative number

Reflect over x-axis

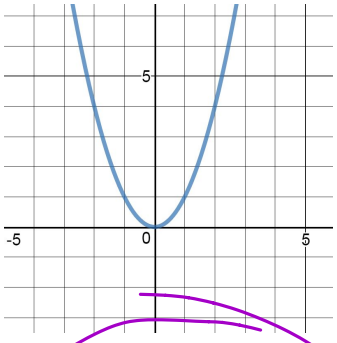
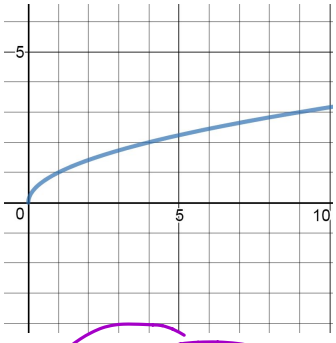
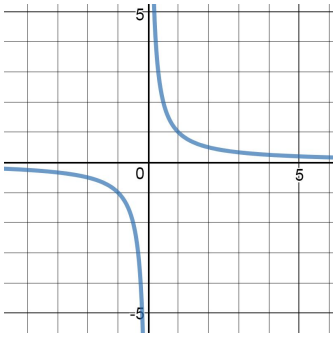
In this unit, you have been introduced to two new types of functions - the square root function and the inverse variation function. Each of these functions also has a parent graph:

Square root function parent graph: $y = \sqrt{x}$

Inverse variation function parent graph: $y = \frac{1}{x}$

Pg 35-40

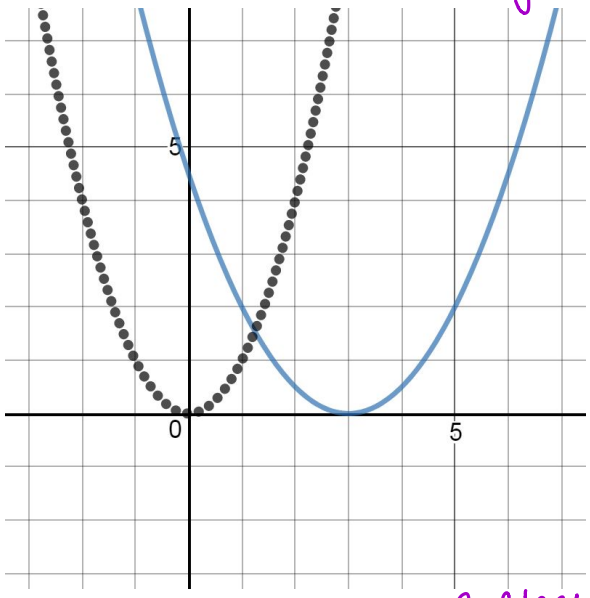
Complete the table below to compare the key features of these three parent functions:

| Feature | Quadratic | Square Root | Inverse Variation |
|---|---|---|---|
| Equation | $y = x^2$ | $y = \sqrt{x}$ | $y = \frac{1}{x}$ |
| Graph |  |  |  |
| Table of Key Points - mark these on the graphs above | x \| y<br>-2 \|<br>-1 \|<br>0 \|<br>1 \|<br>2 \| | x \| y<br>0 \|<br>1 \|<br>4 \| | x \| y<br>-2 \|<br>-1 \|<br>-½ \|<br>½ \|<br>1 \|<br>2 \| |

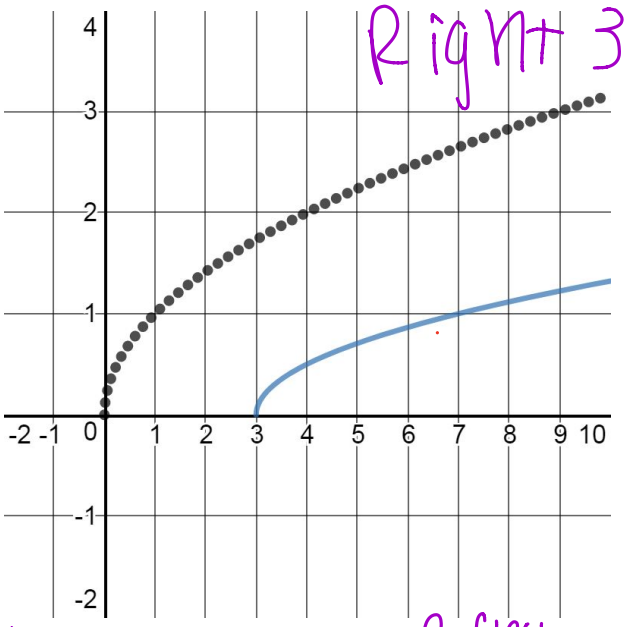
| | $y=x^2$ | $y=\sqrt{x}$ | |
|---|---|---|---|
| Domain | $(-\infty,\infty)$ | $[0,\infty)$ | |
| Range | $[0,\infty)$ | $[0,\infty)$ | |
| Description of Rate of Change | Steeper slope than → So it's R.O.C is greater | Less steep slope than ← so the R.O.C. is less than | |
| Intercepts | x: (0,0) y: (0,0) | x: (0,0) y: (0,0) | |
| Intervals Where Increasing or Decreasing | inc from $(0,\infty)$ Dec from $(-\infty,0)$ | inc from $(0,\infty)$ | |
| Maximum or Minimum | min @ (0,0) | N/A | |
| Symmetry | $x=0$ | N/A | |
| End Behavior | As $x\to\infty$ $y\to\infty$ As $x\to-\infty, y\to\infty$ | As $x\to\infty, y\to\infty$ | |

Jeff graphed the following pairs of functions to see if transformations with square root functions behave in the same way that transformations with quadratic functions do. What do you think? (The parent graph is the dotted curve.)

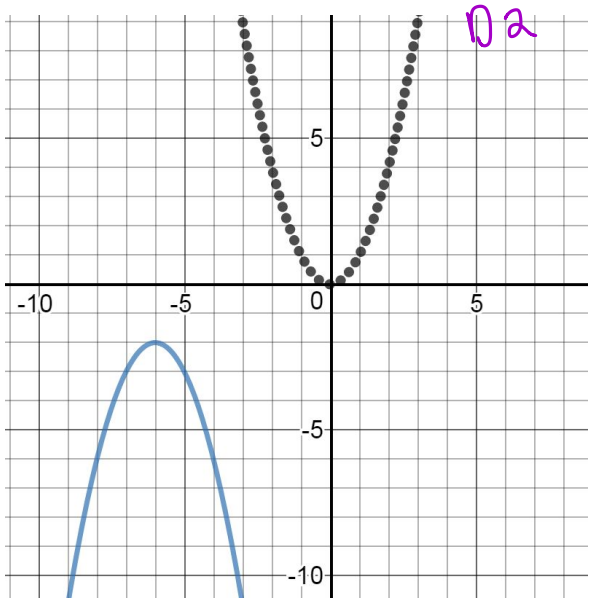
$y = \frac{1}{2}(x-3)^2$ Compress by 1/2 Right 3



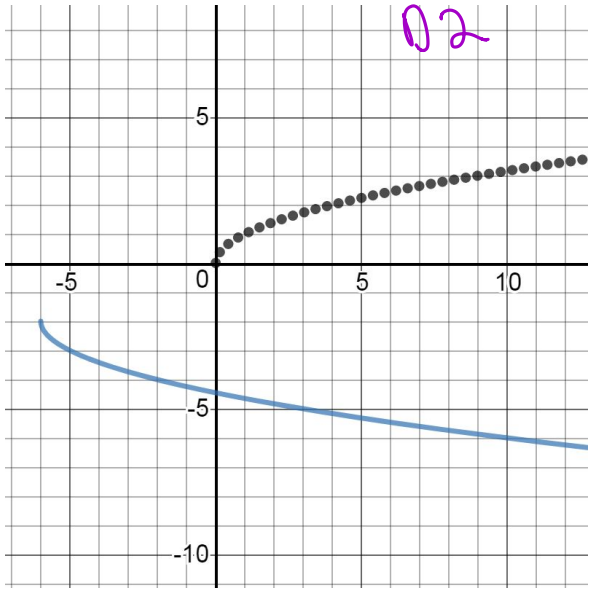

$y = \frac{1}{2}\sqrt{x-3}$ Compress by 1/2 Right 3




$y = -(x+6)^2 - 2$ Reflect x axis LC D2




$y = -\sqrt{x+6} - 2$ Reflect x-axis LC D2



READY, SET, GO! Name _____ Period _____ Date _____

## *READY*

Desmos!

**Topic: Making Tables.**

Fill in the table for the given functions.

1. $f(x) = 2\sqrt{x} + 3$

| x | f(x) |
|---|---|
| 0 | 3 |
| 1 | 5 |
| 4 | 7 |
| 9 | 9 |

2. $f(x) = 2\sqrt{x+4}$

| x | f(x) |
|---|---|
| -4 | 0 |
| -3 | 2 |
| 0 | 4 |
| 5 | 6 |

3. $f(x) = 0.5\sqrt{x+1} - 5$

| x | f(x) |
|---|---|
| -1 | -5 |
| 0 | -4.5 |
| 3 | -4 |
| 8 | -3.5 |

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

| x | f(x) |
|---|---|
| 0 | |
| 1 | |
| 3 | |
| 4 | |

5. $f(x) = \frac{1}{x} + 10$

| x | f(x) |
|---|---|
| -2 | |
| -1 | |
| 1 | |
| 2 | |

6. $f(x) = \frac{6}{(x+1)}$

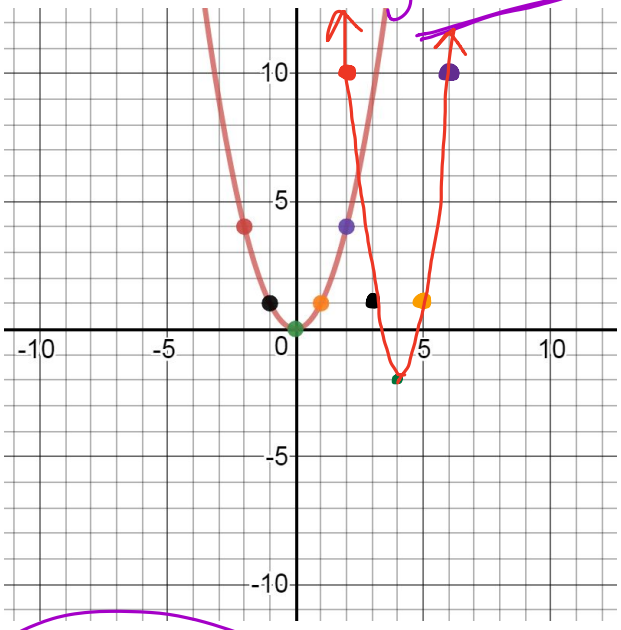
| x | f(x) |
|---|---|
| -7 | |
| -5 | |
| -4 | |
| -3 | |

*SET*

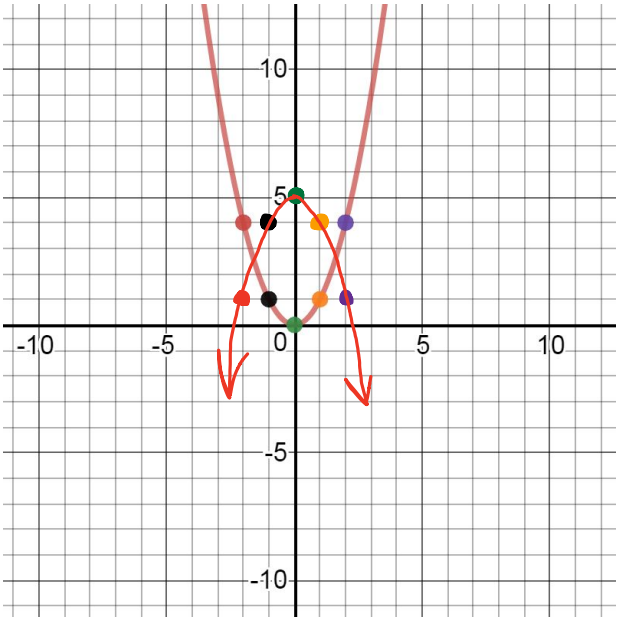
**Topic: Graphing Transformations of Quadratic Functions.**

Given the equation or description, graph the transformation of the parent quadratic function shown in each graph.

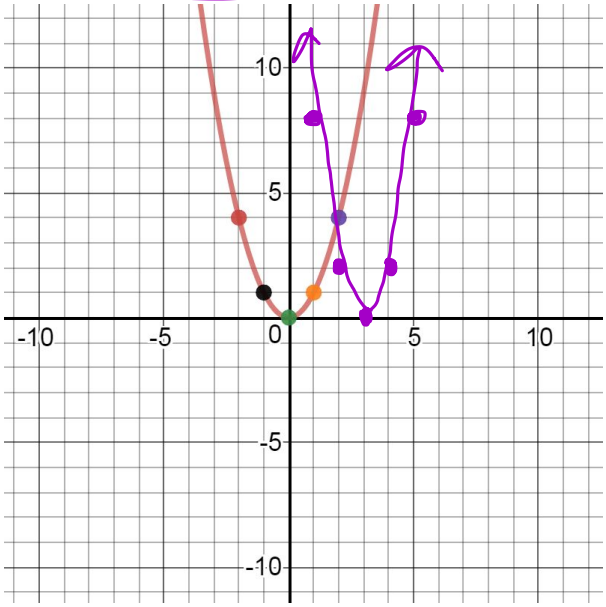
7. The graph has been stretched by a factor of three, shifted four units to the right, and two units down.



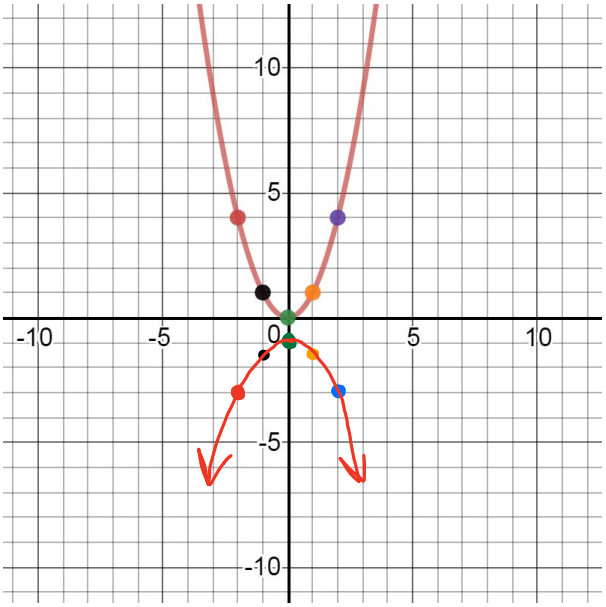

8. The graph has been reflected over the x-axis and shifted 5 units up.




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




10. $f(x) = -0.5x^2 - 1$



Looking back at questions 9 and 10, what transformations do you think have occured to the parent graph $f(x) = \sqrt{x}$ if the new functions are:

11. $f(x) = 2\sqrt{x-3}$ 12. $f(x) = -0.5\sqrt{x} - 1$

Stretch by 2 Right 3 What changes? Reflect x-axis Compress by 1/2 Down 1

*GO!*

**Topic: Direct or Inverse Variation.**

Fill in each blank with varies "directly" or varies "inversely". Find the constant of variation for each scenario.

13. The electric current I, is amperes, in a circuit varies _____ as the voltage V. When 12 volts are applied, the current is 4 amperes. When 18 volts are applied, the current is 6 amperes.

14. The volume V of gas varies _____ to the pressure P. The volume of a gas is 200 $cm^3$ under pressure of 32 $kg/cm^2$. The volume of a gas is 160 $cm^3$ under pressure of 40 $kg/cm^2$.

15. The number of kilograms of water in a person's body varies _____ as the person's mass. A person with a mass of 90 kg contains 60 kg of water. A person with a mass of 45 kg contains 30 kg of water.

16. On a map, distance in km and distance in cm varies _____, so that 25 km are represented by 2cm, and 87.5 km are represented by 7cm.

17. The time it takes to fly from Los Angeles to New York varies _____ as the speed of the plane. One trip takes 6 hours at 900 km/h, at 600 km/h the trip will take 9 hours.