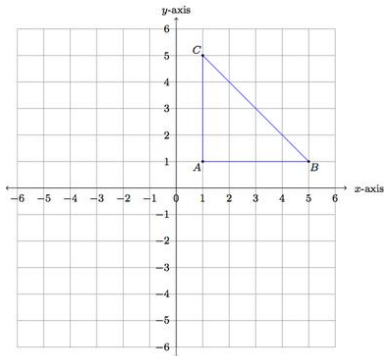## Unit 2 – Transformations

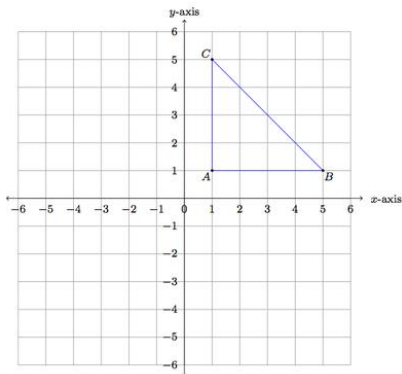**Translation**

tran**SL**ate → **Sl**ide

Moving your original point to the left (-) or right (+) changes the _____.

Moving your original point up (+) or down (-) changes the _____.

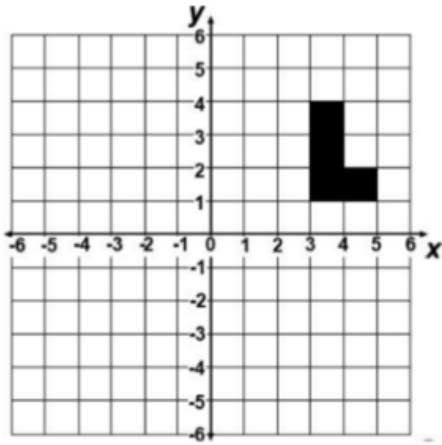| Original (x, y)	Translate up 3 units (x, y+3)	Translate down 2 units (x, y-2)	Translate to the left 1 unit (x-1, y)	Translate to the right 4 units (x+4, y)

Reflection

re**FL**ection → **FL**ip

Treat each axis as a _____. Your new figure should be the _____ of the original one.

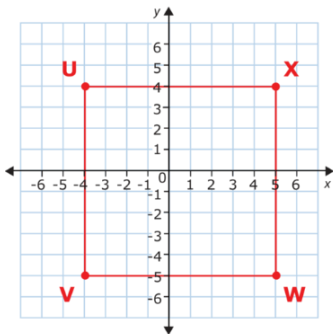| Original (x, y)	Reflect across the y-axis (-x, y)	Reflect across the x-axis (x, -y)	Reflect across the origin (-x, -y)

Rotation

roTation → Turn

You are going to rotate to the next quadrant every 90° depending on if the question says clockwise or counterclockwise.

0° clockwise = _____° counterclockwise
90° clockwise = _____° counterclockwise
180° clockwise = _____° counterclockwise
270° clockwise = _____° counterclockwise

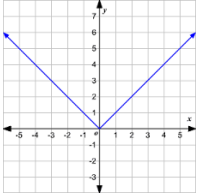| Quadrant I Rotate 0° - original	Quadrant II Rotate 90° counterclockwise around the origin	Quadrant III Rotate 180° counterclockwise around the origin	Quadrant IV Rotate 270° counterclockwise around the origin
(x, y)	(-y, x)	(-x, -y)	(y, -x)

Dilation

Dilation → Shrink or Expand
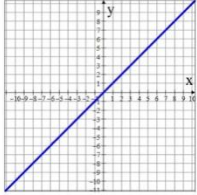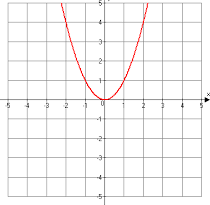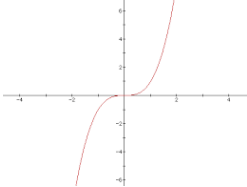
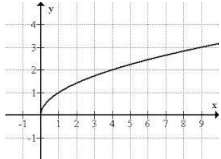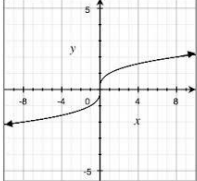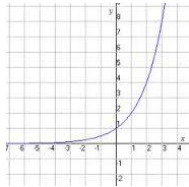If the scale factor is < 1, the figure will get _____ aka _____.

If the scale factor is > 1, the figure will get _____ aka _____.

Original (x, y)	Dilate by a scale factor of 2 (2x, 2y)	Dilate by a scale factor of $\frac{1}{2}$ $\left(\frac{x}{2}, \frac{y}{2}\right)$

Parent Functions

Name	Equation	Graph
Linear	$y = x$	
Quadratic	$y = x^2$	
Cubic	$y = x^3$	
Absolute Value	$y = |x|$	
Square Root	$y = \sqrt{x}$ or $y = x^{\frac{1}{2}}$	
Cubed Root	$y = \sqrt[3]{x}$ or $y = x^{\frac{1}{3}}$	
Exponential	$y = e^x$	

The parent function of a square root is $f(x) = \sqrt{x}$ (basically this is as simple as it gets). We can transform this function by multiplying, adding to, or subtracting numbers from it. You will have to be able to look at an equation and determine what has been done to the parent function and what that change is making the graph do.
The table that I gave you along with the notes will be a lot of help with this.

For example: What are the transformations of $f(x) = \sqrt{x+4}$?

Step 1: Write out the parent function so you can see the differences. $f(x) = \sqrt{x}$
Step 2: Look for differences. I notice that the graph has a +4 under the radical.
Step 3: State what the difference means. The +4 under the radical means that the graph is shifted to the left 4 units.

State the transformations of the following equations.
1. $f(x) = \sqrt{x-2}$
2. $f(x) = \sqrt{x+3} + 2$
3. $f(x) = -\sqrt{x} + 4$
4. $f(x) = 2\sqrt{x+1} - 4$
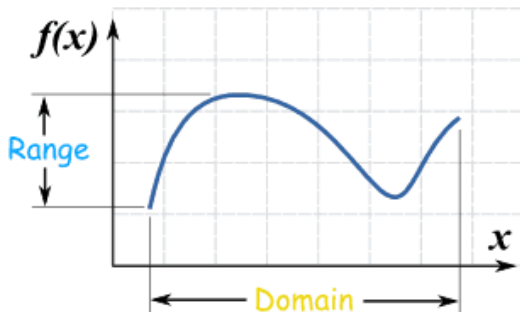5. $f(x) = -\dfrac{1}{2}\sqrt{x+6}$
6. $f(x) = 3\sqrt{(x-2)} - 1$
7. $f(x) = -2\sqrt{x}$
8. Write the equation for an "unstretched" square root function that has been shifted 3 units right and 2 units down.
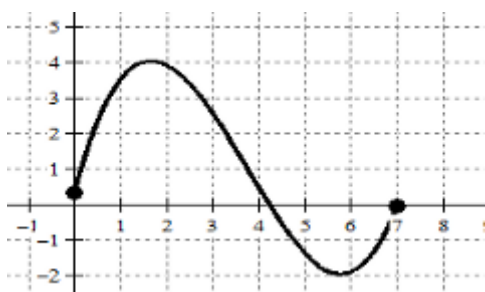
Domain & Range
Domain → x values, what you can put in to the equation
Range → y values, the numbers you get out of the equation

Example: Find the domain and range of the following graph.

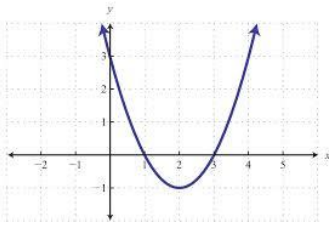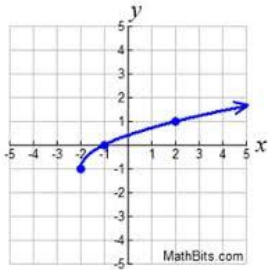Domain: [0,7]
Range: [-2,4]

*You try these:

  9. Find the domain and range of the graph.

10. Find the domain and range of the graph.

11. Find the domain and range of the function $y = \sqrt{x + 3}$. (If you get stuck, graph it.)
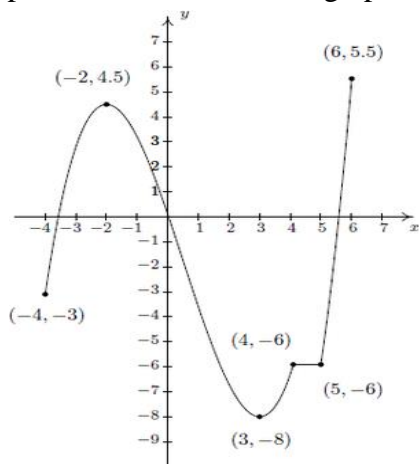
Increasing & Decreasing Intervals

The function $f(x)$ <u>increases</u> when the values of both x and y are increasing.

A function $f(x)$ <u>decreases</u> when the values of x are increasing and the values of y are decreasing.

A function $f(x)$ is <u>constant</u> when the x values increases and the y value remains the same.

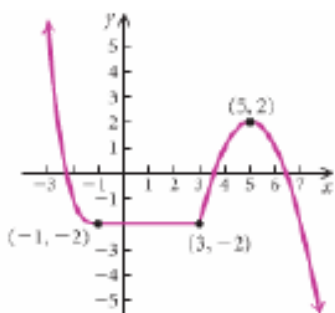Example: Indicated where the graph is increasing, decreasing, or constant.

Increasing: (-4,-2) and (3,4) and (5,6)
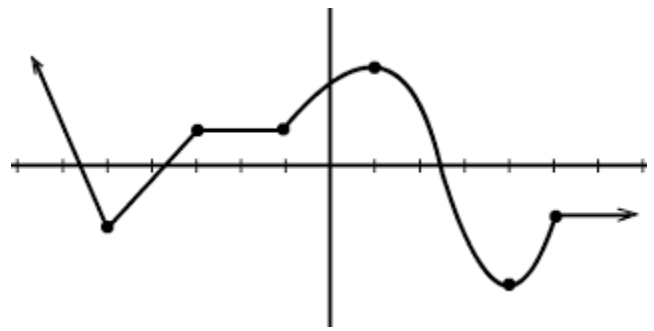
Decreasing: (-2,3)

Constant: (4,5)

The graph of $y = f(x)$

*You try these:

12. Indicate where the graph is increasing, decreasing, and constant. Use interval notation.

13. Indicate where the graph is increasing, decreasing, and constant. Use interval notation.
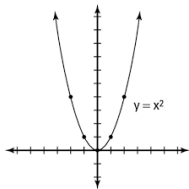
End Behavior

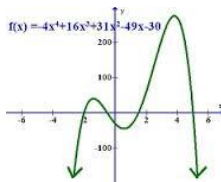|		Degree	
		Even	Odd
Sign of Leading Coefficient	Positive	Up, Up	Down, Up
	Negative	Down, Down	Up, Down

If you are given the equation, you can memorize this table or <u>graph the equation and see which way the arrows go</u>.
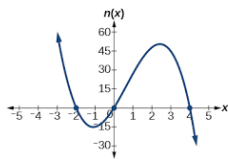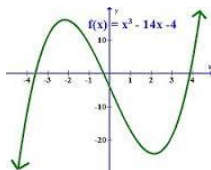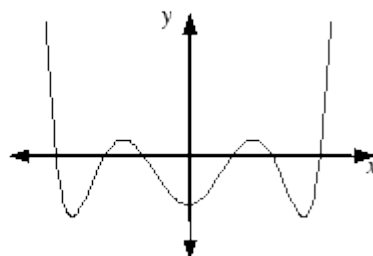
Up, Up

EASIER!!!!!

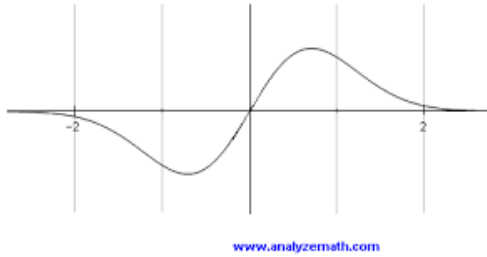Down, Down

Up, Down

Down, Up

Even & Odd Functions
If you can fold the graph along the y-axis and the graph look the same on both sides, the function is even.

Even Function
$f(-x) = f(x)$

If you can turn your paper upside down and the graph still look the same, the function is odd.

If neither of these things work, the function is neither even nor odd.