Final Exam Study Guide

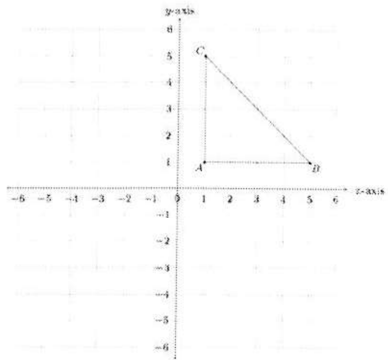
Name: Key

Date: ____________________

<u>Unit 1 – Transformations</u>

Translation

tran**SL**ate → **Sl**ide



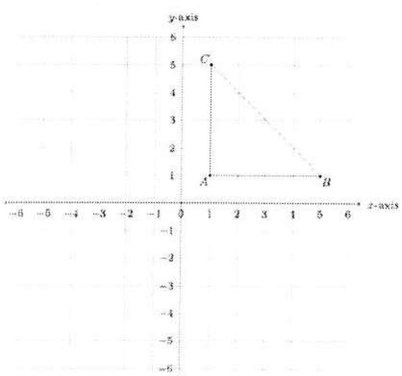
Moving your original point to the left (-) or right (+) changes the x-values.

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

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)
A (1, 1)	A' (1, 4)	A'' (1, -1)	A''' (0, 1)	A'''' (5, 1)
B (5, 1)	B' (5, 4)	B'' (5, -1)	B''' (4, 1)	B'''' (9, 1)
C (1, 5)	C' (1, 8)	C'' (1, 3)	C''' (0, 5)	C'''' (5, 5)

Reflection

re**FL**ection → **FL**ip

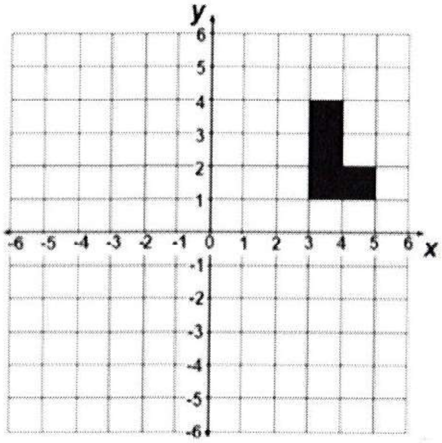


Treat each axis as a line of symmetry. Your new figure should be the mirror of the original one.

Original (x, y)	Reflect across the y-axis (-x, y)	Reflect across the x-axis (x, -y)	Reflect across the origin (-x, -y)
A (1, 1)	A' (-1, 1)	A'' (1, -1)	A''' (-1, -1)
B (5, 1)	B' (-5, 1)	B'' (5, -1)	B''' (-5, -1)
C (1, 5)	C' (-1, 5)	C'' (1, -5)	C''' (-1, -5)

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 = 360 ° counterclockwise

90°clockwise = 270 ° counterclockwise

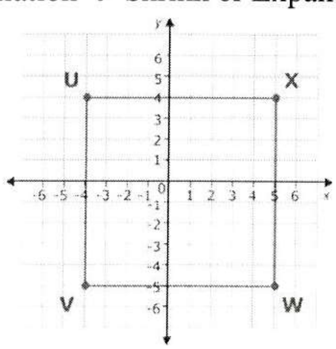
180° clockwise = 180 ° counterclockwise

270° clockwise = 90 ° 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)
A (3, 4)	A' (-4, 3)	A'' (-3, -4)	A''' (4, -3)
B (4, 4)	B' (-4, 4)	B'' (-4, -4)	B''' (4, -4)
C (4, 2)	C' (-2, 4)	C'' (-4, -2)	C''' (2, -4)
D (5, 2)	D' (-2, 5)	D'' (-5, -2)	D''' (2, -5)
E (5, 1)	E' (-1, 5)	E'' (-5, -1)	E''' (1, -5)
F (3, 1)	F' (-1, 3)	F'' (-3, -1)	F''' (1, -3)

Dilation

Dilation → Shrink or Expand

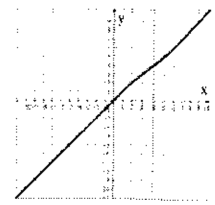
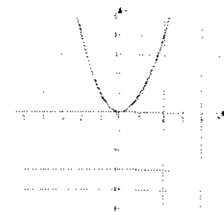
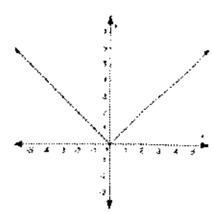
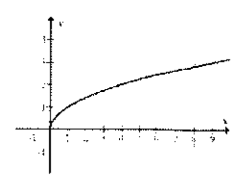
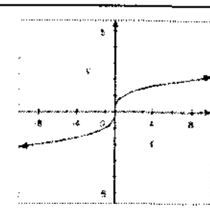
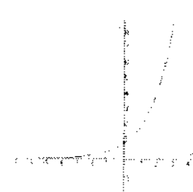


If the scale factor is < 1, the figure will get smaller aka shrink.

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

Original (x, y)	Dilate by a scale factor of 2 (2x, 2y)	Dilate by a scale factor of $\frac{1}{2}$ $\left(\frac{x}{2}, \frac{y}{2}\right)$
U (-4, 4)	U' (-8, 8)	U'' (-2, 2)
V (-4, -5)	V' (-8, -10)	V'' (-2, -5/2)
W (5, -5)	W' (10, -10)	W'' (5/2, -5/2)
X (5, 4)	X' (10, 8)	X'' (5/2, 2)

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.

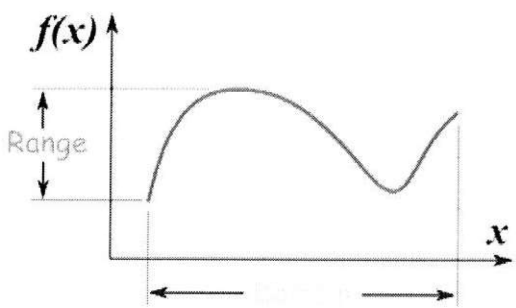
State the transformations of the following equations.

1. $f(x)=\sqrt{x-2}$ shifts 2 units to the right
2. $f(x)=\sqrt{x+3}+2$ shifts 3 units left and 2 units up
3. $f(x)=-\sqrt{x}+4$ reflects across the x axis and shifts 4 units up
4. $f(x)=2\sqrt{x+1}-4$ vertical stretch, shift 1 unit to the left, and down 4 units
5. $f(x)=-\frac{1}{2}\sqrt{x+6}$ reflect across the x axis, vertical shrink, shift 6 units left
6. $f(x)=3\sqrt{(x-2)}-1$ vertical stretch, shift 2 units to the right, 1 unit down
7. $f(x)=-2\sqrt{x}$ reflect across the x axis, vertical stretch
8. Write the equation for an "unstretched" square root function that has been shifted 3 units right and 2 units down. $f(x)=\sqrt{x-3}-2$

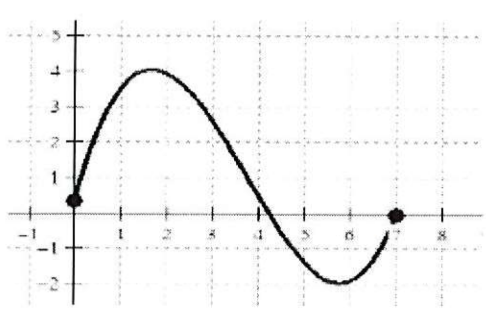
Domain & Range

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.

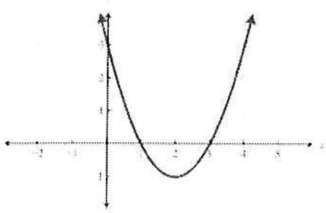


Domain: [0,7]

Range: [-2,4]

*You try these:

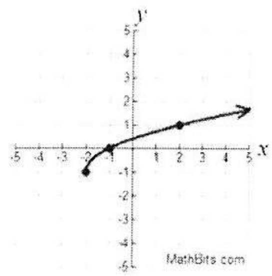
9. Find the domain and range of the graph.



domain: $(-\infty, \infty)$

range: $[-1, \infty)$

10. Find the domain and range of the graph.



domain: $[-2, \infty)$

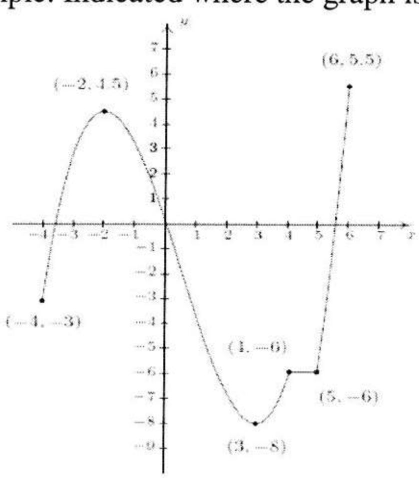
range: $[-1, \infty)$

11. Find the domain and range of the function $y = \sqrt{x+3}$. (If you get stuck, graph it.) domain: $[-3, \infty)$

range: $[0, \infty)$

Increasing & Decreasing Intervals

The function $f(x)$ increases when the values of both x and y are increasing.
A function $f(x)$ decreases when the values of x are increasing and the values of y are decreasing.
A function $f(x)$ is constant when the x values increases and the y value remains the same.
Example: Indicated where the graph is increasing, decreasing, or constant.

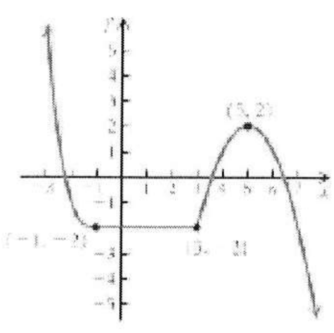


The graph of $y = f(x)$

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

*You try these:

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



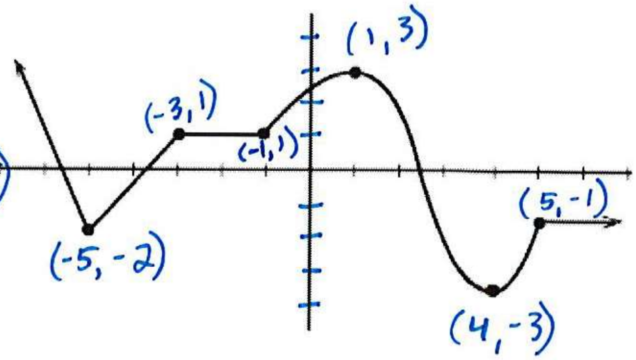
increasing: $(3, 5)$

decreasing: $(-\infty, -1)$ and $(5, \infty)$

constant: $(-1, 3)$

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

increasing: $(-5,-3)$ and $(-1,1)$ and $(4,5)$
decreasing: $(-\infty,-5)$ and $(1,4)$
constant: $(-3,-1)$ and $(5,\infty)$



End Behavior

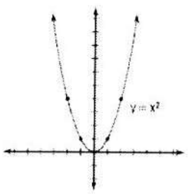
Sign of Leading Coefficient / Degree

	Even	Odd
Positive	Up, Up	Down, Up
Negative	Down, Down	Up, Down

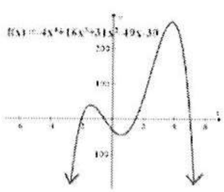
If you are given the equation, you can memorize this table or graph the equation and see which way the arrows go.

EASIER!!!!!

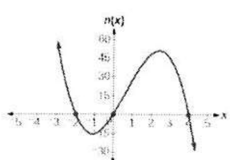
Up, Up



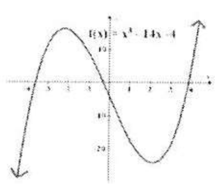
Down, Down



Up, Down



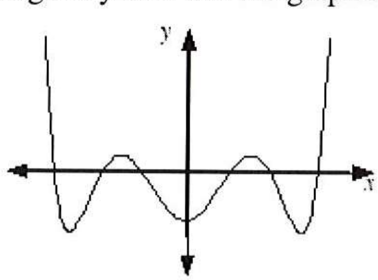
Down, Up



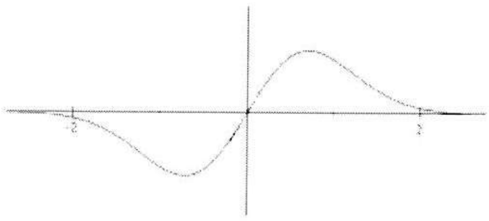
Even & Odd Functions

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.



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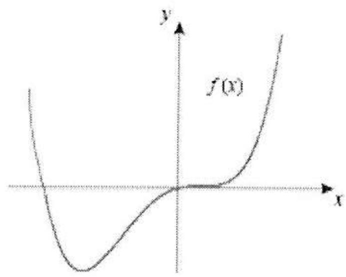
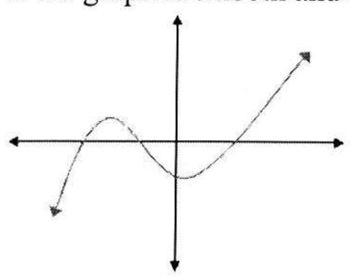
If neither of these things work, the function is neither even nor odd.

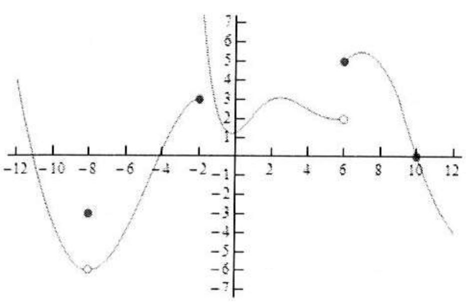


Continuous vs. Discontinuous

If the graph is smooth and doesn't stop or have a hole anywhere, it is continuous.



If the graph isn't smooth or if it has a hole, it is called discontinuous.



<u>Unit 2 – Quadratics</u>

Add & Subtract Polynomials

14. $(19e^3 + 4e^2) + (11e^3 - 6e^2)$ $= 30e^3 - 2e^2$
15. $(-11h^4 + 4h) - (-6h^4 + 3h^2 - 5h)$ $= -5h^4 - 3h^2 + 9h$
16. The fence around a quadrilateral-shaped garden is $6a^2 + 12a - 14$ long. Three sides of the fence have the following lengths:
    $7a$, $10a - 5$, and $2a^2 - 6$. What is the length of the fourth side of the fence? $= 4a^2 - 5a - 3$