

# Lesson 29 – Transformations of Functions - Day 2

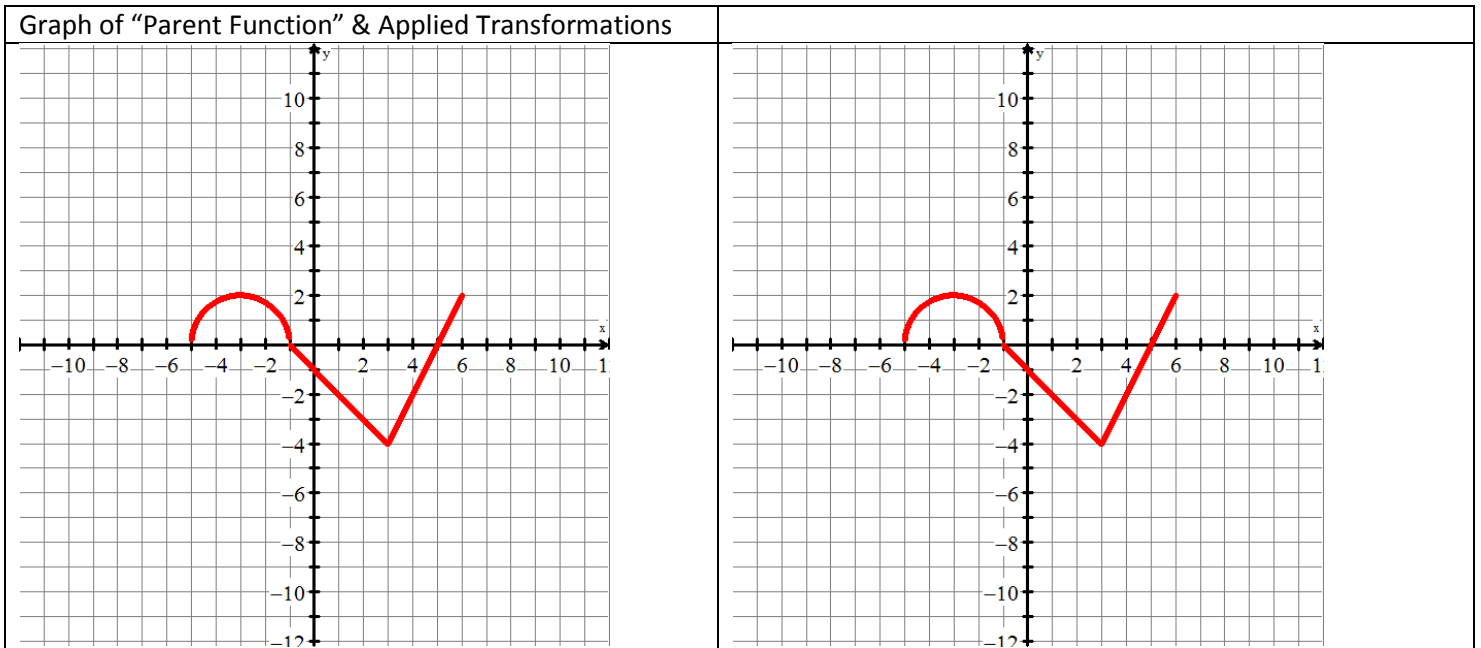
## (A) Lesson Objectives:

- a. Consolidate observations from Lesson 29 – day 1 investigations
- b. Apply multiple function transformations: Given a graph of a “parent” function, apply transformations and sketch the new function ( $G \rightarrow T \rightarrow S$ )
- c. Apply multiple function transformations: Given an equation of a “transformed function”, identify the transformations of the “parent” function and then sketch the “transformed function” ( $E \rightarrow T \rightarrow S$ )

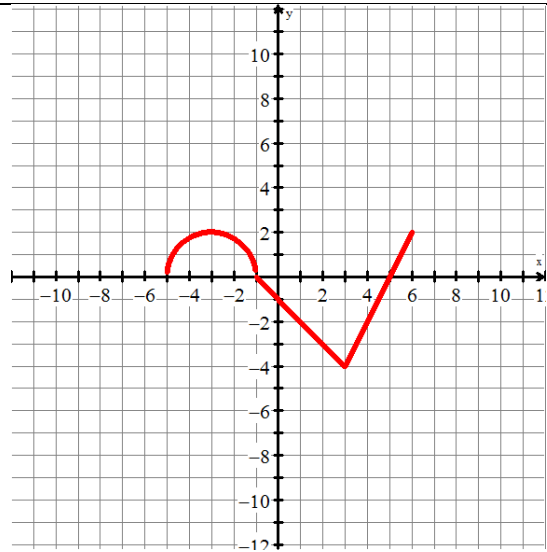
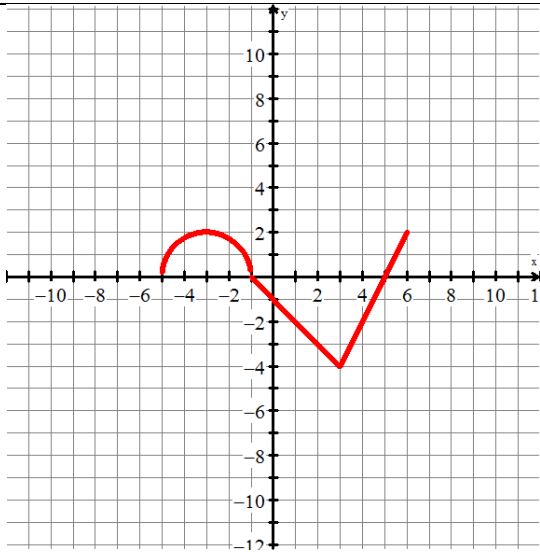
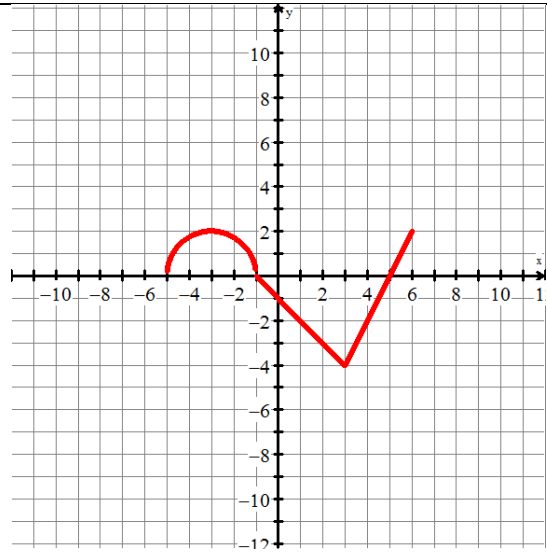
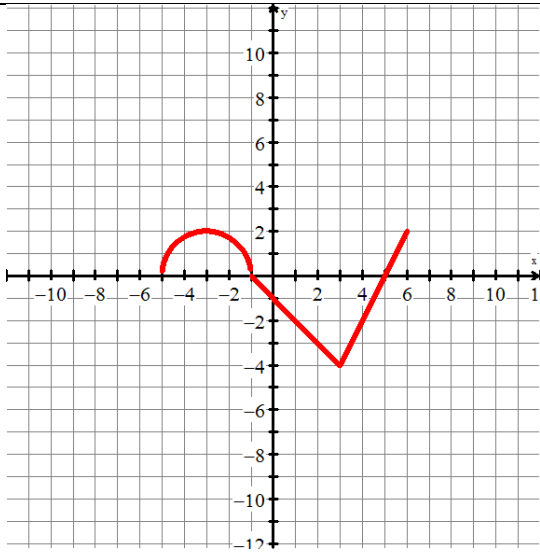
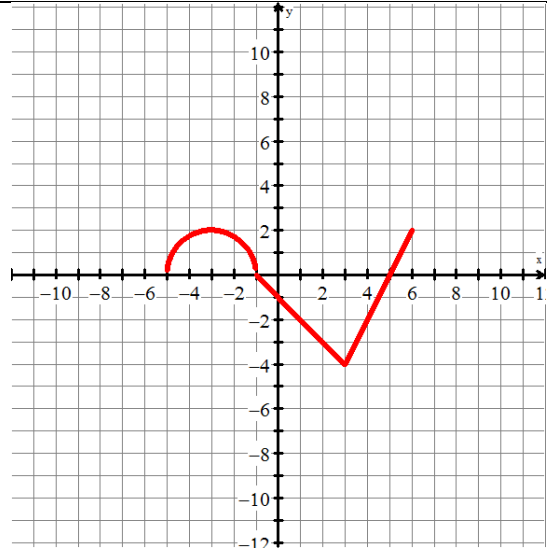
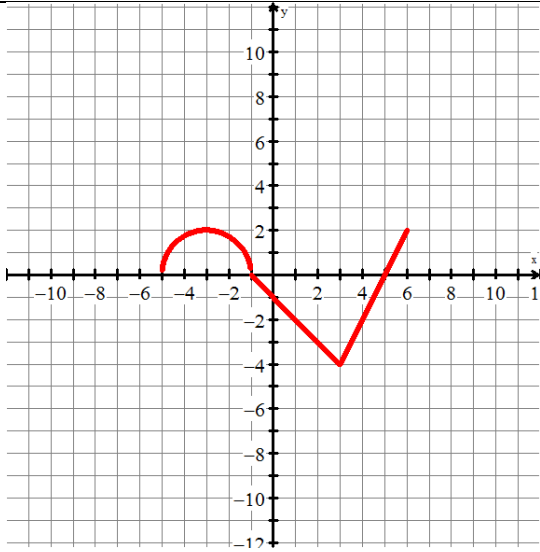
## (B) Consolidation $\rightarrow$ Summary of Transformations

$Y = f(x) + d$	
$Y = af(x)$	
$Y = f(bx)$	
$Y = f(x + c)$	
$Y = -f(x)$	
$Y = f(-x)$	

## (C) Applying Multiple Function Transformations $\rightarrow$ Working from Graphs

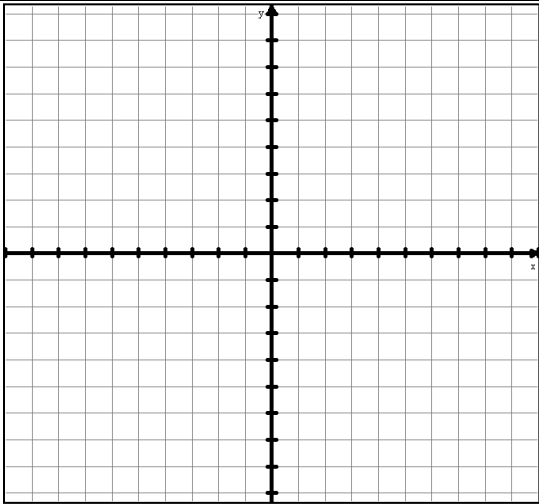


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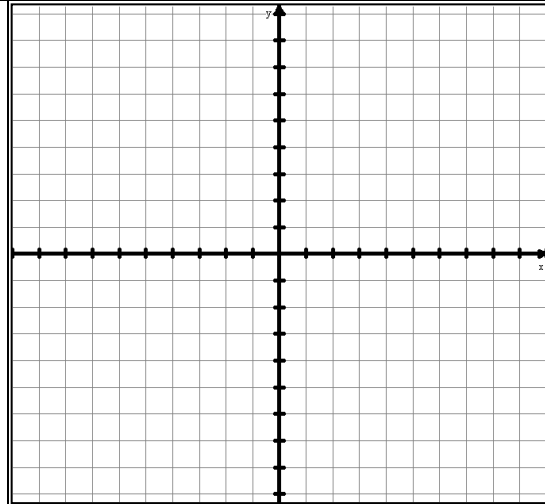


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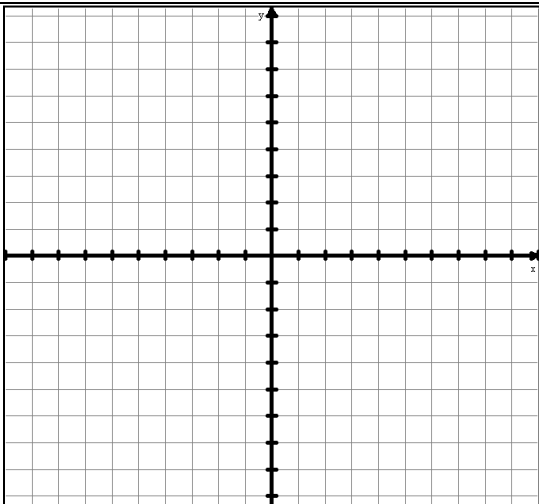
(D) Applying Multiple Function Transformations → Working from Equations



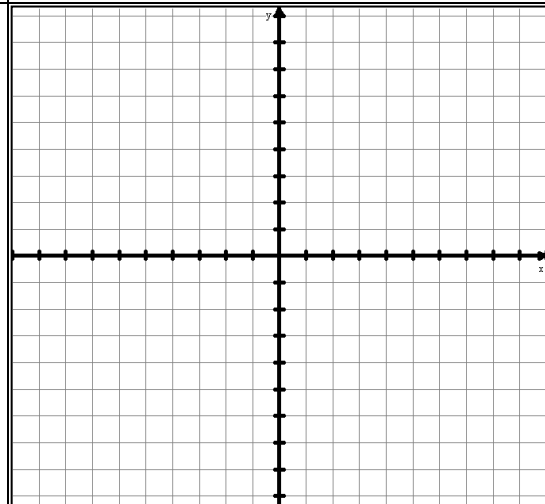
$$f(x) = x^2 - 3$$



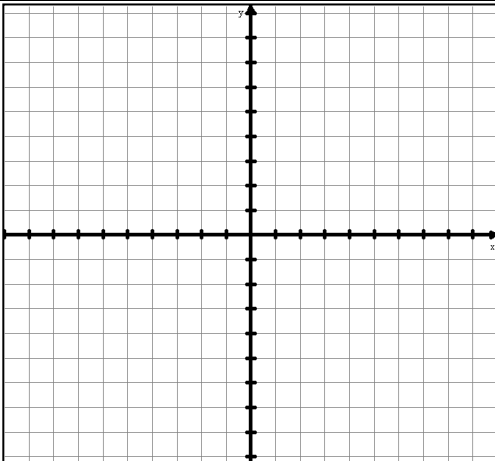
$$f(x) = (x+1)^2 - 3$$



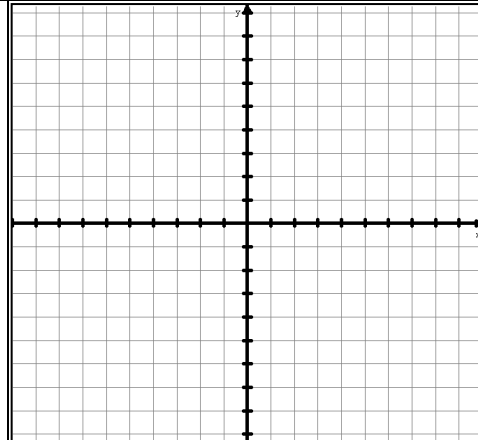
$$f(x) = \sqrt{x-4}$$



$$f(x) = \sqrt{x-4} + 3$$



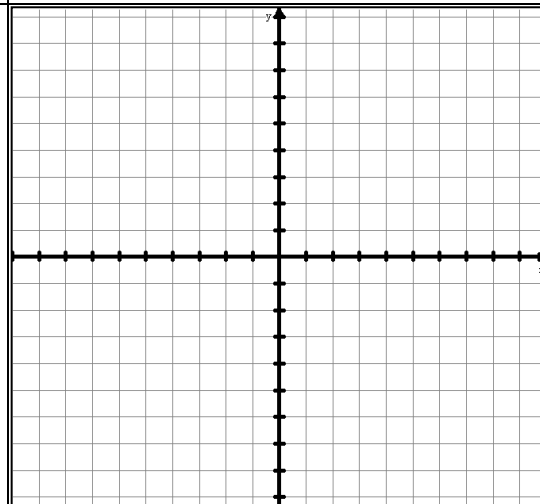
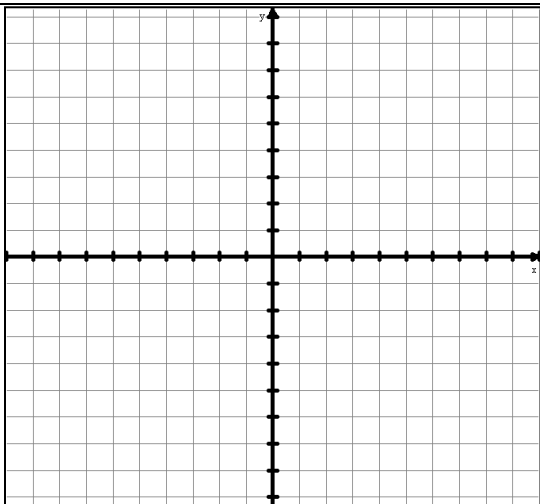
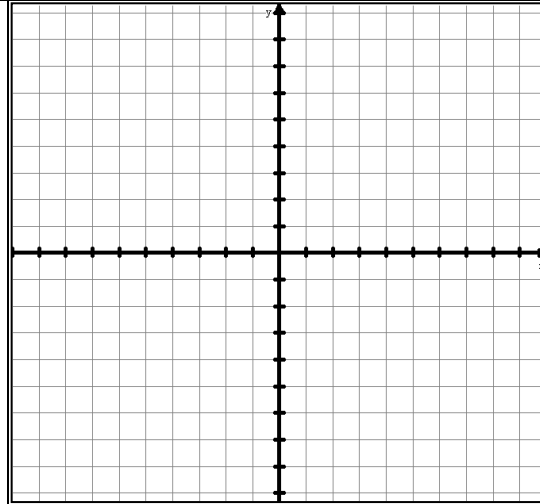
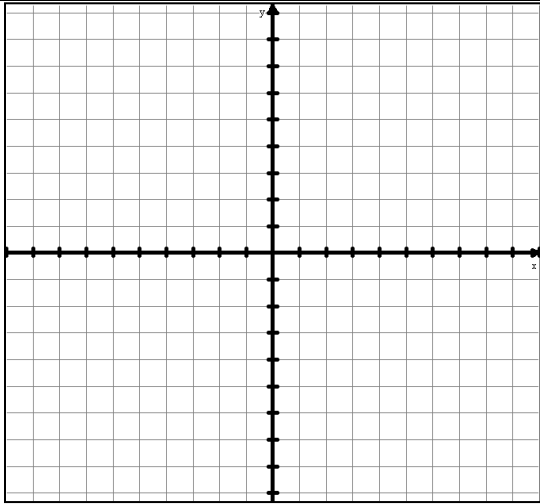
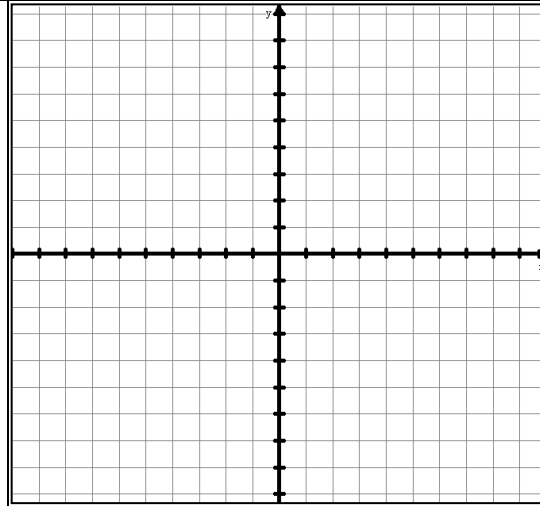
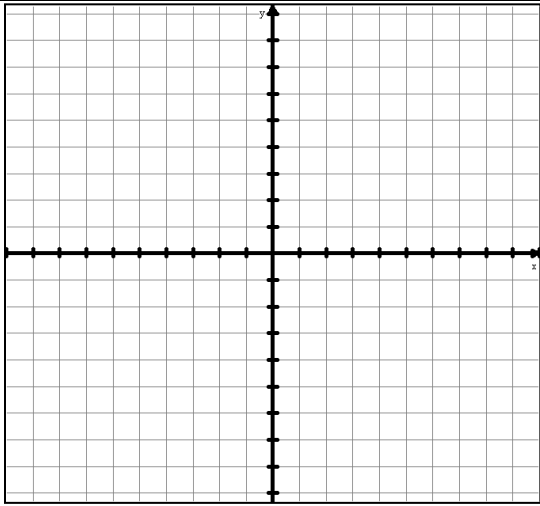
$$f(x) = \frac{1}{x} + 2$$



$$f(x) = \frac{1}{x-3} + 2$$

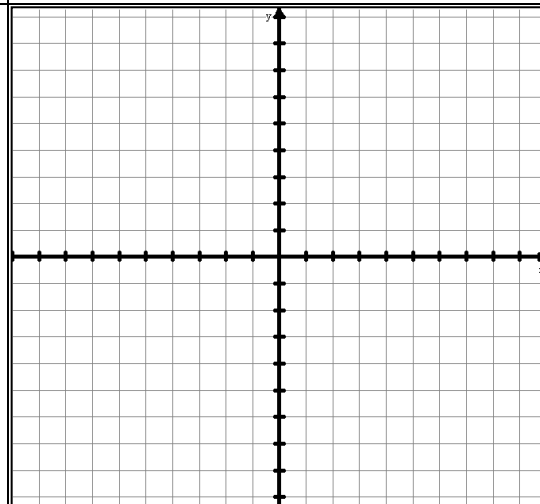
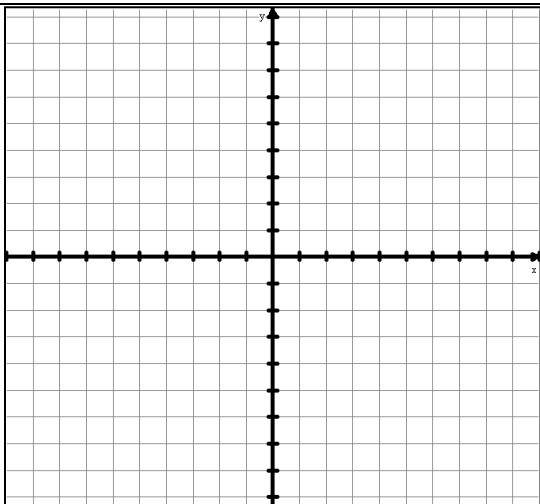
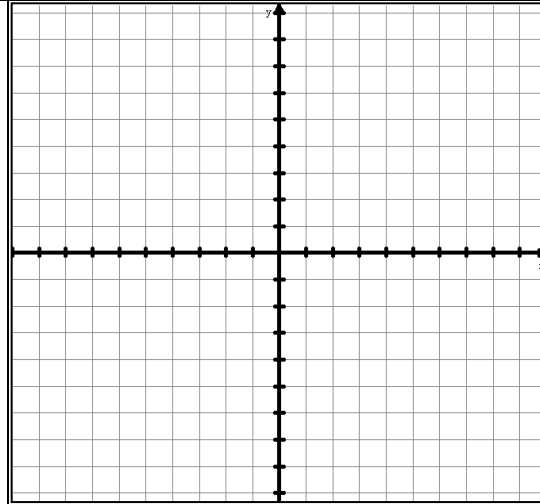
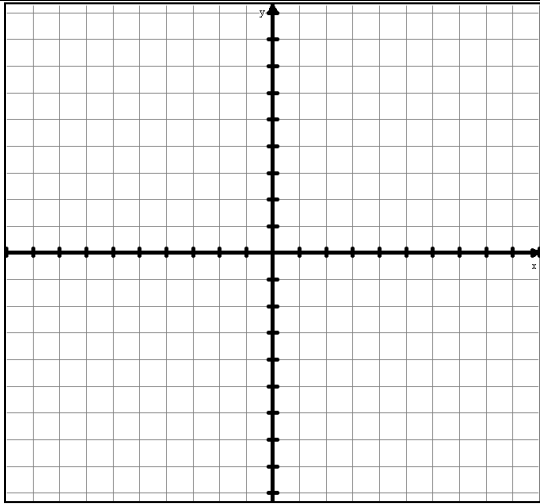
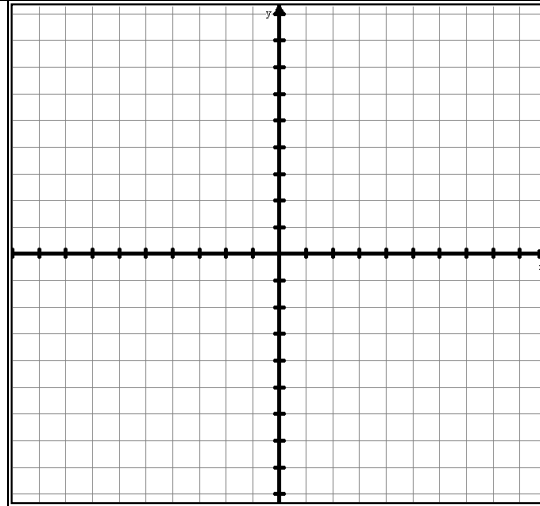
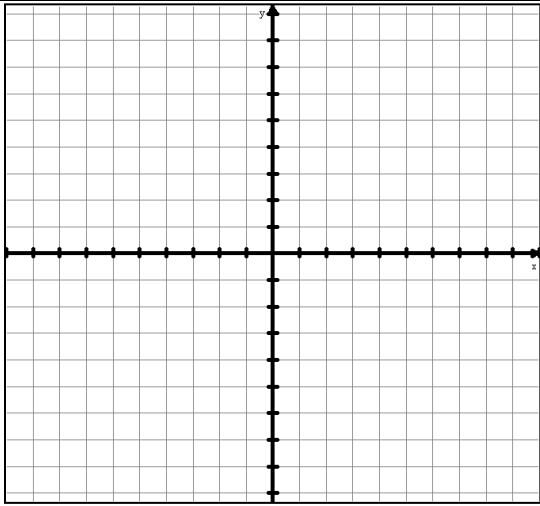
# Lesson 29 – Transformations of Functions - Day 2

(D) Applying Multiple Function Transformations → Working from Equations



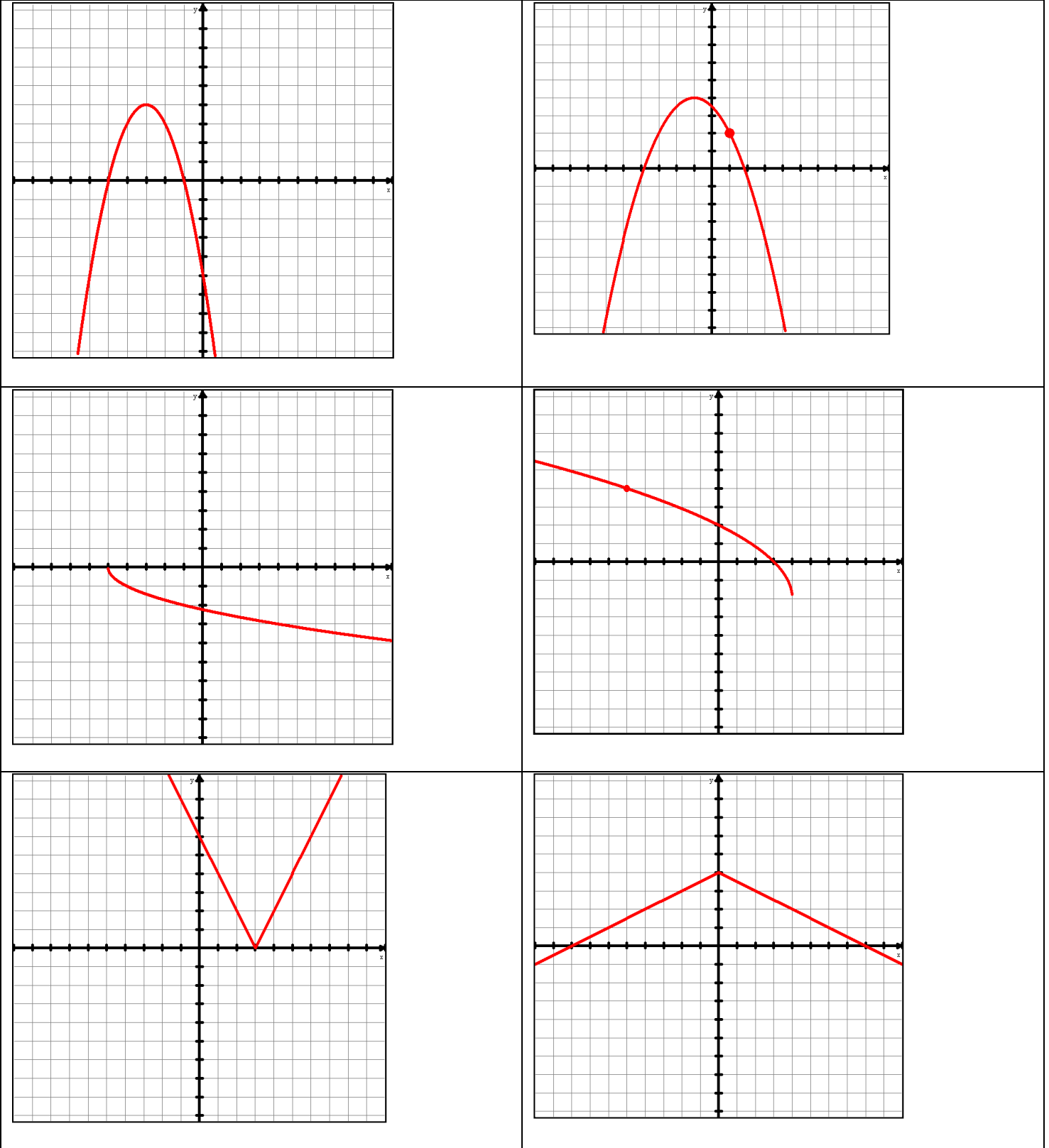
# Lesson 29 – Transformations of Functions - Day 2

(D) Applying Multiple Function Transformations → Working from Equations



# Lesson 29 – Transformations of Functions - Day 2

(E) Determining Equations → Working With Transformed Functions



## Lesson 29 – Transformations of Functions - Day 2

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(E) Conections: Vertex Form of Quadratic Equations & Transformations

Suppose the graph of  $f$  is given. Describe how the graph of each function can be obtained from the graph of  $f$ .

1.  $y = f(x) + 4$

2.  $y = 2f(x - 2) + 2$

3.  $y = f(2x) - 1$

A function  $f$  is given, and the indicated transformations are applied to its graph (in the given order). Write the equation for the final graph.

4.  $f(x) = x^3$ ; shift upward 3 units and shift 2 units to the right.

5.  $f(x) = \sqrt{x}$ ; reflect in the  $y$ -axis, shrink vertically by a factor of  $\frac{1}{2}$ , and shift upward 2 units.

6.  $f(x) = |x|$ ; shift to the left 1 unit, stretch vertically by a factor of 3, and shift upward 5 units.

Explain how the graph  $g$  is obtained from the graph of  $f$ .

7.  $f(x) = x^3$ ;  $g(x) = (x - 1)^3 - 1$

8.  $f(x) = |x|$ ;  $g(x) = 2|x| + 3$

2. If  $(2,3)$  is a point on the graph of  $y = f(x)$ , which of the following must be on the graph of  $y = f(2x)$ ?

- (a)  $(4,3)$
- (b)  $(2,6)$
- (c)  $(1,3)$
- (d)  $(2,3/2)$

3. Graph each function using the techniques we've talked about in class. Start with the graph of the basic library function and show all stages.

- (a)  $f(x) = -\sqrt{x+3}$
- (b)  $h(x) = (x+2)^2 - 3$
- (c)  $g(x) = -2(x+2)^3 - 8$

<http://www.mathsisfun.com/sets/function-transformations.html>

<http://ms.wiatrek.org/page8/files/Transformation.pdf>