Transformations Video Lecture

Section 2.5

Course Learning Objectives:

1) **Graph absolute value, square root, greatest integer, and polynomial functions and use such graphs to solve applied problems and to understand the significance of attributes of the graph to such applied problems.**
2) **Identify and articulate the significance of graphical components in a mathematical model/application.**

Weekly Learning Objectives:

1) **Graph the functions in the Library of Functions.**
2) **Graph functions using vertical and horizontal shifts.**
3) **Graph functions using compressions and stretches.**
4) **Graph functions using reflections about the x-axis and y-axis.**
5) **Be able to identify what transformations are present in an equation.**
6) **Given the graph of a function, apply transformations to it to find a new graph.**
7) **Given a point on a function, find points on a transformation of the function.**

Transformations

Graph the following functions on your calculator and see what you observe:

$$y = x^2$$
$$y = x^2 + 2$$
$$y = x^2 - 2$$

Result:

f(x) + k **Vertical shift** **k units**

f(x) - k **Vertical shift** **k units**

Graph the following functions on your calculator and see what you observe:

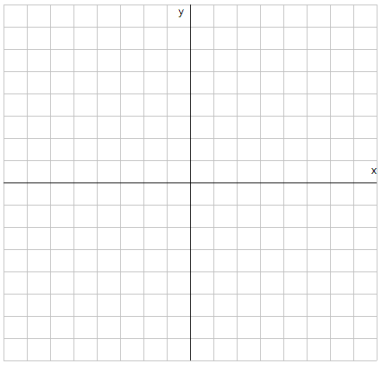
$$y = x^2$$
$$y = (x-3)^2$$
$$y = (x+2)^2$$

Result:

f(x+k) **Horizontal shift** **k units**

f(x-k) **Horizontal shift** **k units**

Graph the following function by hand and list the transformations used: $y = (x+4)^2 - 5$



Graph the following functions on your calculator and see what you observe:

$y = |x|$

$y = 2|x|$

$y = \frac{1}{2}|x|$

Result:

af(x) (if a>1) Vertical by a factor of a (makes graph steeper)

af(x) (if 0<a<1) Vertical by a factor of a (makes graph flatter)

Graph the following functions on your calculator and see what you observe:

$y = \sin x$

$y = \sin(2x)$

$y = \sin(\frac{1}{2}x)$

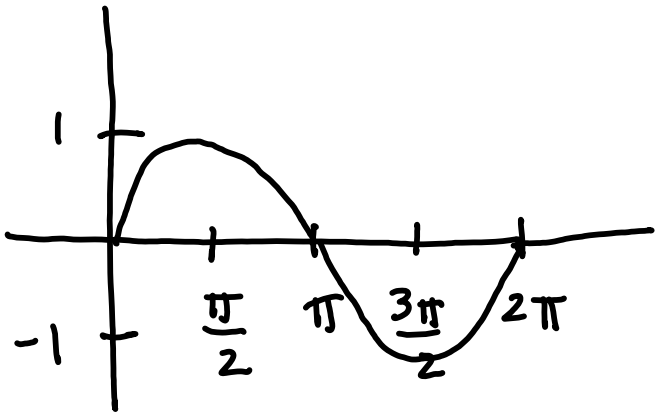
Result:

f(ax) (if a>1) Horizontal by a factor of 1/a

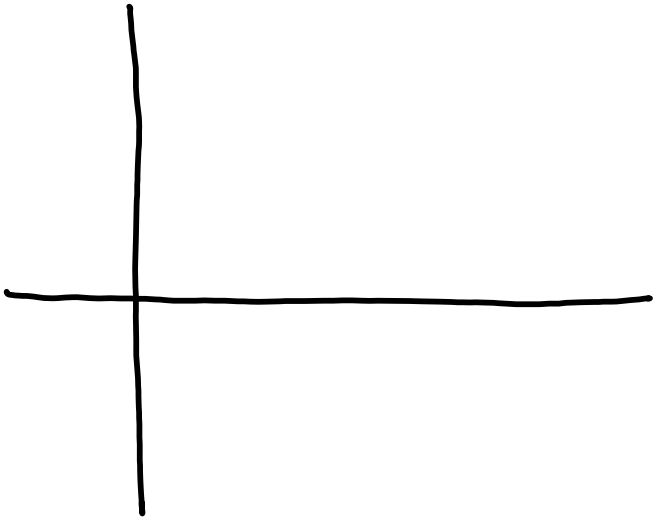
f(ax) (if 0<a<1) Horizontal by a factor of a

Given the graph of f(x), use the graph to find:

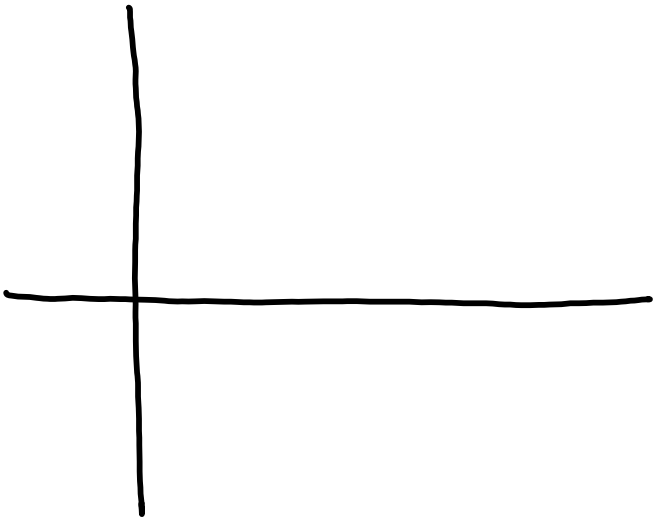
f(x):



y = 2f(x)



y = f(3x)



Graph the following functions on your calculator and see what you observe:

$$y = \sqrt{x}$$
$$y = -\sqrt{x}$$
$$y = \sqrt{-x}$$

Result:

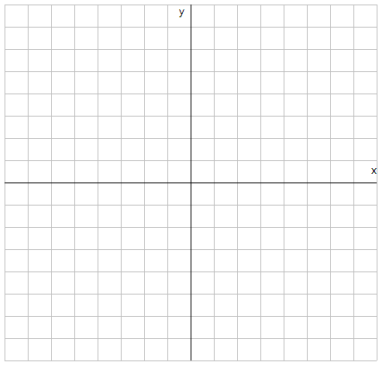
-f(x) **Vertical reflection over the**

f(-x) **Horizontal reflection over the**

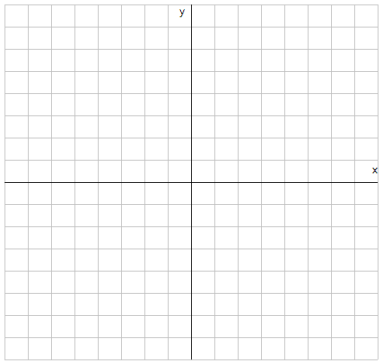
Look for Summary of Transformations pdf file!

Sketch the graph of the following and describe the transformations being applied.

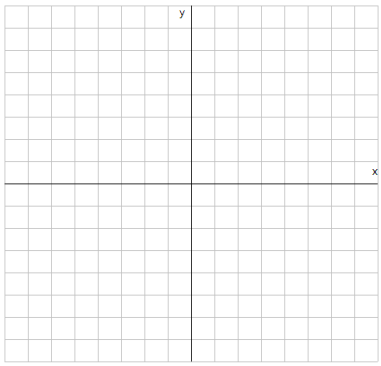
$y = -|x+3| - 2$



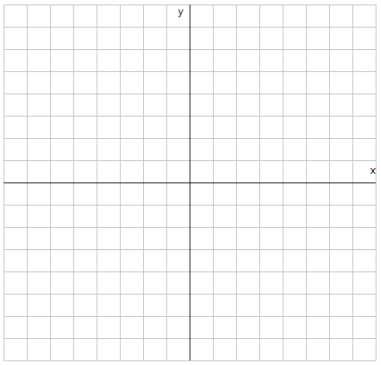
$y = \sqrt{-x} + 1$



$y = [\![\frac{1}{2}x]\!]$



$y = 2(x-1)^2 - 3$



In order to correctly identify the right transformations, it is important that the function be in the following form:

af(b(x+c))+d

*****any coefficient in front of x should be factored out first, or else you will get the wrong horizontal translation.**

a affects: Vertical stretch/compression

b affects: Horizontal stretch/compression

c affects: Horizontal translation

d affects: Vertical translation

Put each of the following expressions in the proper form for graphing and identify what transformations are being applied.

$g(x) = |4x-3|+2$

$$g(x) = 2[\![3x+1]\!]$$

$$g(x) = \sqrt{1-x} + 2$$

Find the domain and range of g(x) too.

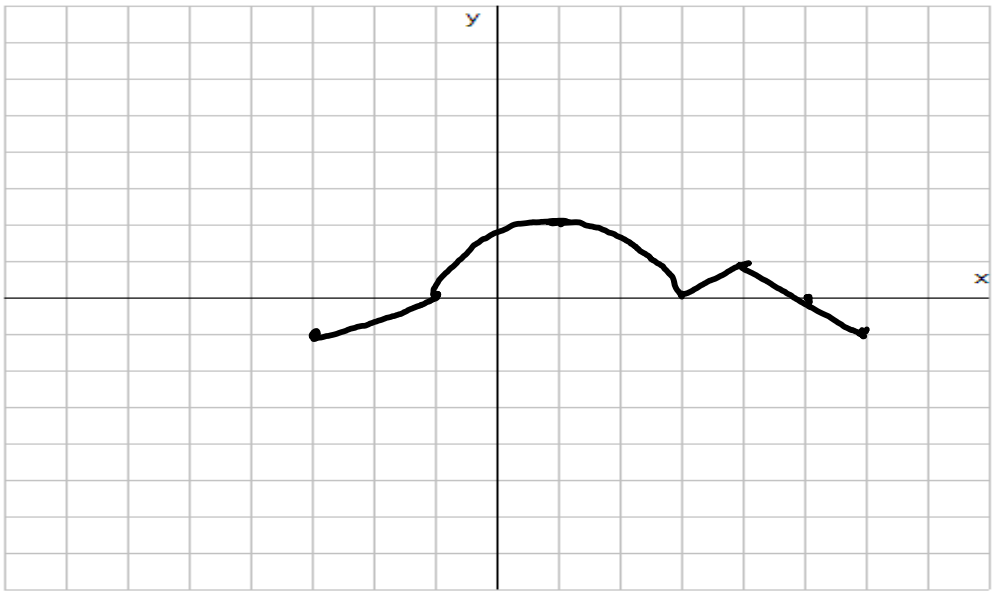
$$g(x) = -2x^2 + 4x$$

The graph of f(x) contains the point (4, -1).
What point is guaranteed to be on the on the graph of:

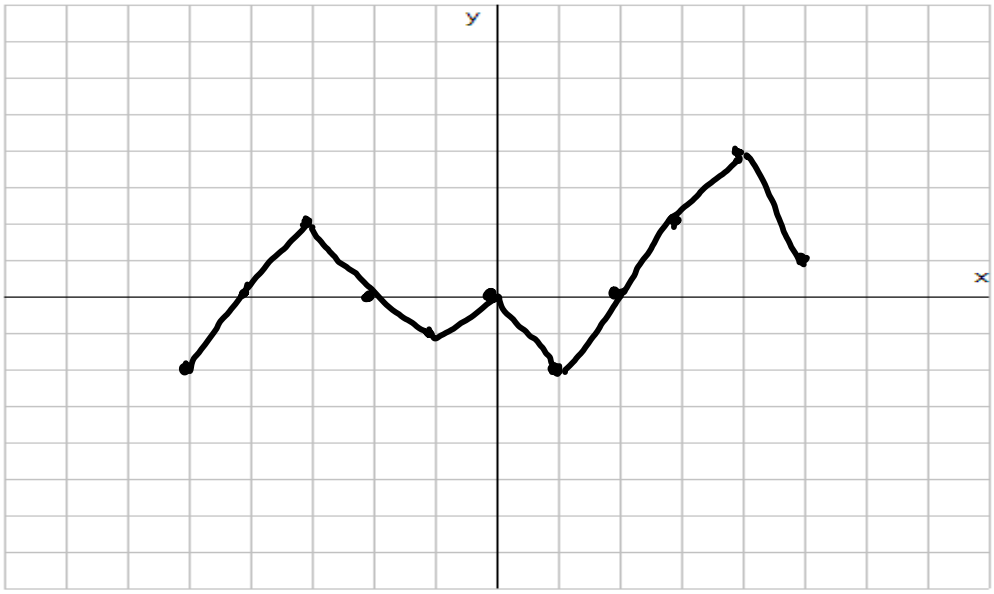
a) $y = f(2x) - 3$?

b) $y = 3f(x+1) - 2$?

Shown below is the graph of f(x). On the same grid, sketch a graph of $g(x) = -f(x) + 2$.



Shown below is the graph of f(x). On the same grid, sketch a graph of g(x) = | f(x) |.



Shown below is the graph of f(x). On the same grid, sketch a graph of g(x) = f(|x|).

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