

Sunday, October 07, 2018  
6:47 PM

Precalc **KEY** 1.7A: Horiz & Vert Shifts

Obj: to write and graph transformed equations of parent functions with horizontal and/or vertical shifts

Hwk:

- 1.7A #5 (a, b, e), 7 (a, b, d), 21, 29, 37
  - Finish Classwork packet
- Check answers!!!

Do Now:

Top of "1.7A Horizontal and Vertical Function Shifts" packet:

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_  
1.7A – Horizontal and Vertical Function Shifts

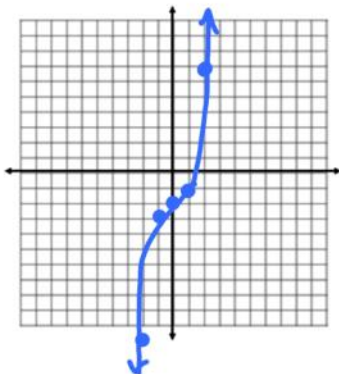
I. Do Now:

WITHOUT A CALCULATOR, sketch the graph of each transformed function.

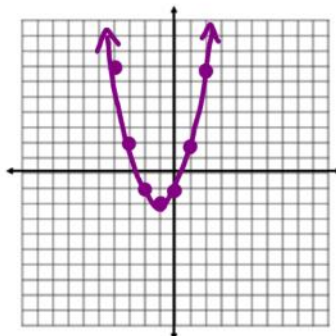
Rewrite

$$k(x) = \sqrt{x-3} - 2$$

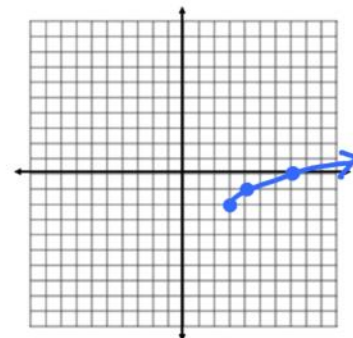
1.  $g(x) = x^3 - 2$



2.  $h(x) = (x + 1)^2 - 2$



3.  $k(x) = \sqrt{-3+x} - 2$



Class Notes:

This section involves all types of transformations on graphs -

- Shifting left/right/up/down
- Stretching/shrinking/reflecting

Today we are dealing with shifting:

Vertical Shift:

Let  $c$  be a pos. real #:

Shift **UP**  $c$  units:  $h(x) = f(x) + c$

Shift **DOWN**  $c$  units:  $h(x) = f(x) - c$

function notation

Horizontal Shift:\*

Let  $c$  be a pos. real #:

Shift **RIGHT**  $c$  units:  $h(x) = f(x - c)$

Shift **LEFT**  $c$  units:  $h(x) = f(x + c)$

*\*Note movement is OPPOSITE sign*

*\* If horizontal and vertical shifts only, then the order of transformations doesn't matter.*

Examples: (do on Do Now/Notes sheet)

Ex. 1)  $g(x - 4)$

Ex. 2)  $h(x) + 6$

Ex. 3)  $k(x + 5) - 2$

II. Class Notes:

Identify the shift in each, then graph the new functions:

Ex. 1.  $g(x - 4)$

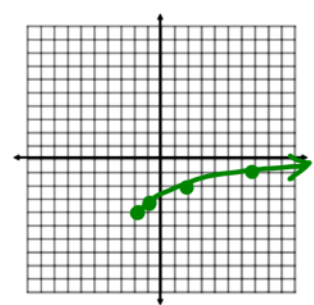
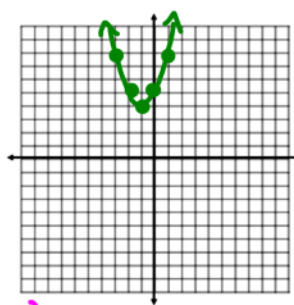
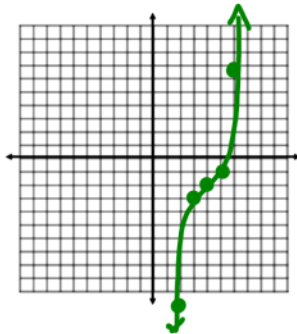
Ex. 2.  $h(x) + 6$

Ex. 3.  $k(x + 5) - 2$

shift: **Shift 4 Rt**

shift: **Shift 6 up**

shift: **shift 5 left, 2 down**



Do Ex. 4 & 5 *xy ADD to x (OPP) SUBTRACT FROM y*

*We do*

Ex. 4. Suppose  $(2, 4)$  is a point on the function  $y = f(x)$ . Name a point on the graph of:

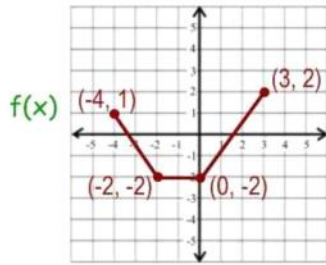
- a.  $y = f(x - 3) - 7$       $(5, -3)$       $(2 + 3, 4 - 7)$
- b.  $y = f(x) + 2$       $(2, 6)$       $(2, 4 + 2)$
- c.  $y = f(x - 1)$       $(3, 4)$       $(2 + 1, 4)$

*You do*

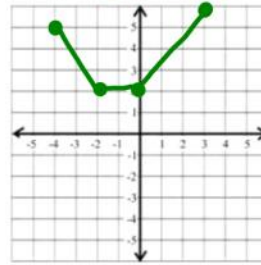
Ex. 5. Suppose  $(3, 9)$  is a point on the function  $y = f(x)$ . Name a point on the graph of:

- a.  $y = f(x + 1) + 3$       $(2, 12)$       $(3 - 1, 9 + 3)$
- b.  $y = f(x - 4) - 1$       $(7, 8)$       $(3 + 4, 9 - 1)$
- c.  $y = f(x) + 4$       $(3, 13)$       $(3, 9 + 4)$

Use the graph of  $f(x)$  to sketch each of the following:



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



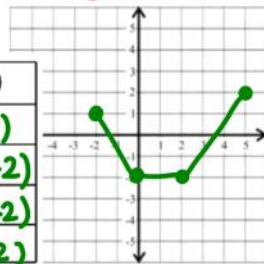
\* Shift up 4  
add 4 to y values

$f(x)$	$h(x)$
$(-4, 1)$	$(-4, 5)$
$(-2, -2)$	$(-2, 2)$
$(0, -2)$	$(0, 2)$
$(3, 2)$	$(3, 6)$

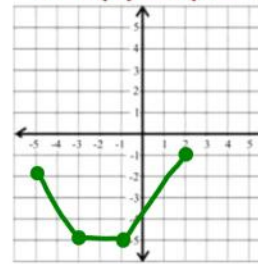
\* Shift 2 right  
add 2

2.  $g(x) = f(x - 2)$

$f(x)$	$g(x)$
$(-4, 1)$	$(-2, 1)$
$(-2, -2)$	$(0, -2)$
$(0, -2)$	$(2, -2)$
$(3, 2)$	$(5, 2)$



3.  $k(x) = f(x + 1) - 3$

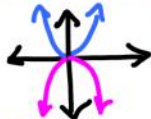


\* Shift 1 left, 3 down  
subtract 1, subtract 3

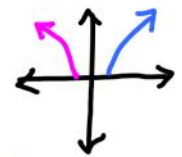
$f(x)$	$k(x)$
$(-4, 1)$	$(-5, -2)$
$(-2, -2)$	$(-3, -5)$
$(0, -2)$	$(-1, -5)$
$(3, 2)$	$(2, -1)$

**Reflection** - type of transformation that results in the mirror image of the original graph.

Ex.)  $f(x) = x^2$  vs.  $g(x) = -x^2$  vs.  $h(x) = (-x)^2$



How do these three graphs compare?



How can you reflect in the y-axis? What have we already studied that shows a reflection in the y-axis? (even functions)

**Reflection in the Coordinate Axes:**

If given graph of  $y = f(x)$ , then

- Reflection in **x-axis** :  $h(x) = -f(x)$
- Reflection in **y-axis** :  $h(x) = f(-x)$

## Do 1.7A Shifting Parent Functions WS

On Practice WS,

- write the equation of transformed function  $g(x)$
- Use function notation to write  $g(x)$  in terms of  $f(x)$

If time, Formative Assessment:

Given  $(2, -1)$ , find a point on the graph:

a)  $f(x) + 2$  ← ADD TO Y

b)  $f(x) - 3$

c)  $f(x - 4)$  ← ADD TO X

d)  $f(x + 1)$  ← SUBTRACT FROM X

e)  $f(x - 2) + 3$  ← ADD TO X  
← ADD TO Y

a)  $(2, -1 + 2)$   
 $(2, 1)$

b)  $(2, -1 - 3)$   
 $(2, -4)$

c)  $(2 + 4, -1)$   
 $(6, -1)$

d)  $(2 - 1, -1)$   
 $(1, -1)$

e)  $(2 + 2, -1 + 3)$   
 $(4, 2)$