Using Mapping Notation to Describe Transformations:

*Think of this as a set of instructions to follow to TRANSFORM a graph

x	y = x²
−3	9
−2	4
−1	1
0	0
1	1
2	4
3	9

x	y = x² + 2
−3	11
−2	6
−1	3
0	2
1	3
2	6
3	11

x	y = (x − 5)²
2	9
3	4
4	1
5	0
6	1
7	4
8	9

(x, y)

$(x, y) \to (x, y+2)$

$(3, 9) \to (3, 9+2)$
$\to (3, 11)$

$(x, y) \to (x+5, y)$

$(-1, 1) \to (-1+5, 1)$
$\to (4, 1)$

Generalize...

$$g(x) = f(x+h) + k \qquad y = f(x)$$

$\Rightarrow$ Left "h" & up "k"

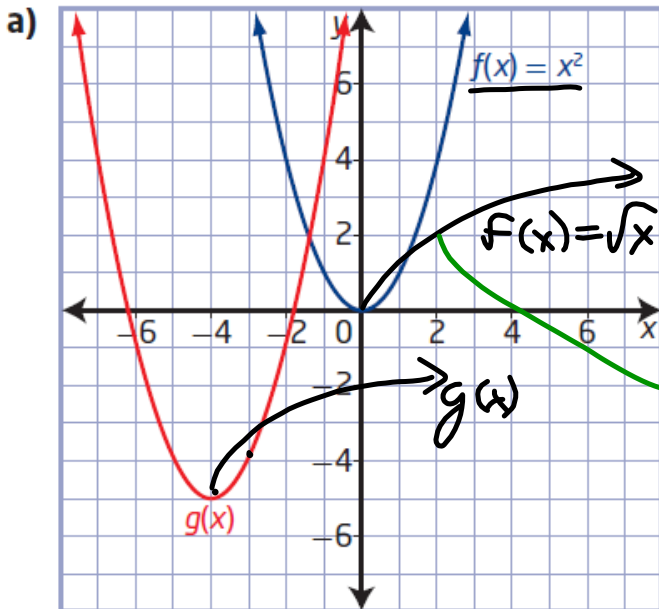$$(x, y) \to (x-h, y+k)$$

ex. $g(x) = f(x-2) - 9$
           ↑
           Right

(1) Identify any transformations

(2) Write a mapping to generate g(x) from f(x)

(3) If $(-7, 13)$ is on f(x), what are the corresponding coordinates after transformations?

① Right 2
   Down 9

2/ $(x, y) \to (x+2, y-9)$

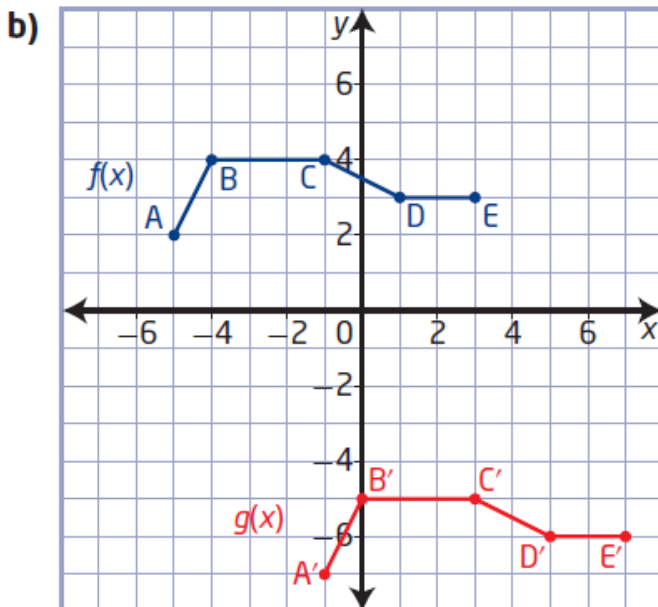3/ $(-7, 13) \to (-7+2, 13-9)$
           $\to (-5, 4)$
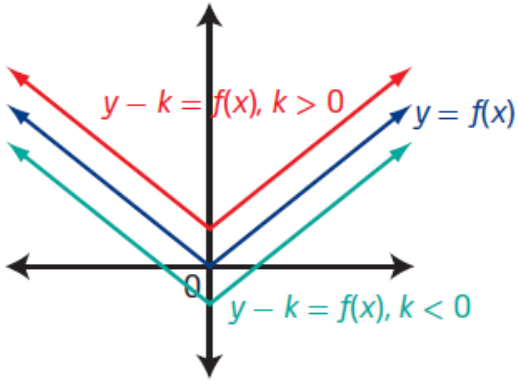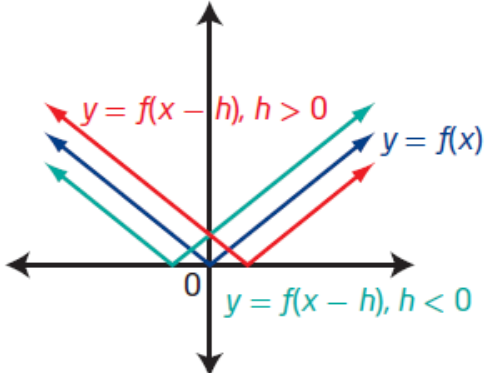
Determine the Equation of a Translated Function

a)

$$g(x) = (x+4)^2 - 5$$

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

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

$$g(x) = \sqrt{x+4} - 5$$

b)

$$g(x) = f(x-4) - 9$$

Transformation from $y = f(x)$	Mapping	Example
A vertical translation If $k > 0$, the translation is up. If $k < 0$, the translation is down.	$(x, y) \rightarrow (x, y + k)$	
A horizontal translation If $h > 0$, the translation is to the right. If $h < 0$, the translation is to the left.	$(x, y) \rightarrow (x + h, y)$	

Check-Up...

Copy and complete the table.

Translation	Transformed Function	Transformation of Points
vertical	$y = f(x) + 5$	$(x, y) \rightarrow (x, y + 5)$
7 Left	$y = f(x + 7)$	$(x, y) \rightarrow (x - 7, y)$
Rt. 3	$y = f(x - 3)$	$(x, y) \rightarrow (x+3, y)$
Down 6	$y = f(x) - 6$	$(x, y) \rightarrow (x, y - 6)$
horizontal and vertical	$y + 9 = f(x + 4)$ 9	$(x, y) \rightarrow (x-4, y-9)$
horizontal and vertical	$y = f(x-4) - 6$	$(x, y) \rightarrow (x + 4, y - 6)$
H & V	$y = f(x+2) + 3$	$(x, y) \rightarrow (x - 2, y + 3)$
horizontal and vertical	$y = f(x - h) + k$	$(x, y) \rightarrow (x+h, y+k)$

$$f(x) = x + 8$$
$$= (x+8)^2$$

Practice Problems...

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#3, 5, 6, 7, 10, 11, 18

Quiz
- Function Notation
- Piecewise functions
- Domain & Range