

Lesson 19: Translating Functions

Classwork

Opening Exercise

Graph each set of three functions in the same coordinate plane (on your graphing calculator or a piece of graph paper). Then, explain what similarities and differences you see among the graphs.

a. $f(x) = x$

$g(x) = x + 5$

$h(x) = x - 6$

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

$g(x) = x^2 + 3$

$h(x) = x^2 - 7$

c. $f(x) = |x|$

$g(x) = |x + 3|$

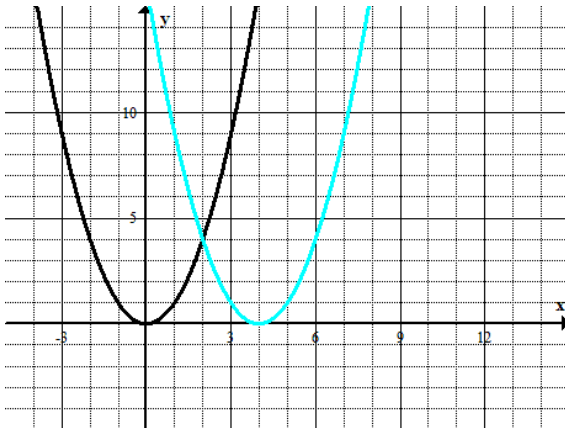
$h(x) = |x - 4|$

Example

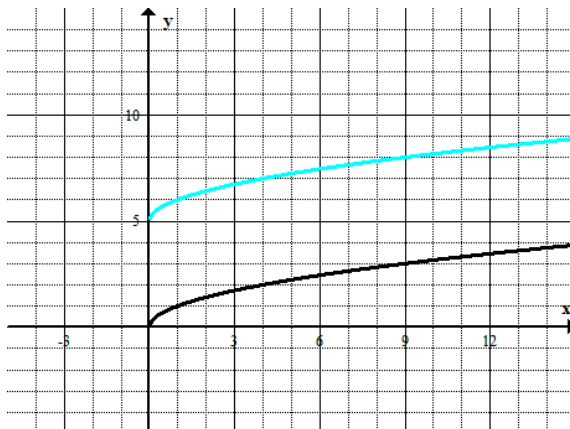
For each graph, answer the following:

- What is the parent function?
- How does the translated graph relate to the graph of the parent function?
- Write the formula for the function depicted by the translated graph.

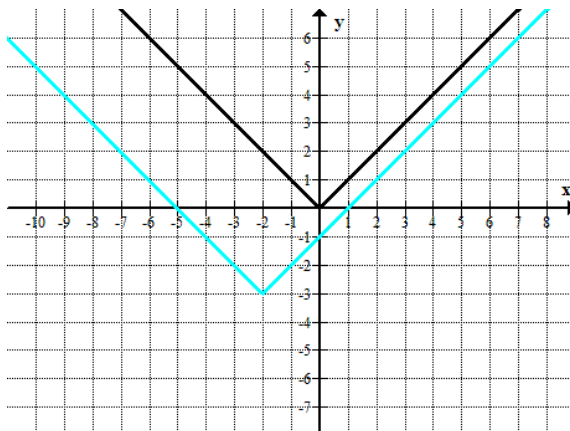
a.



b.

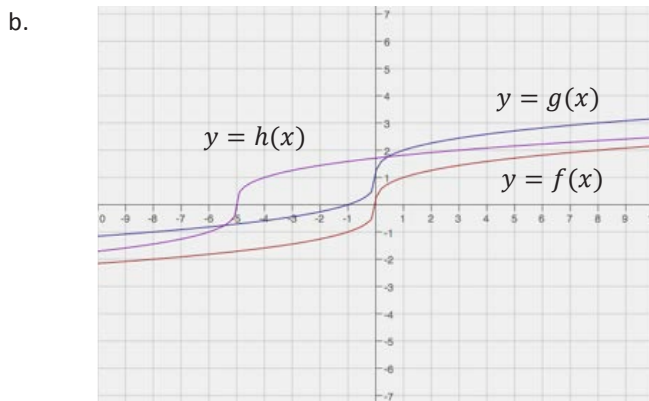
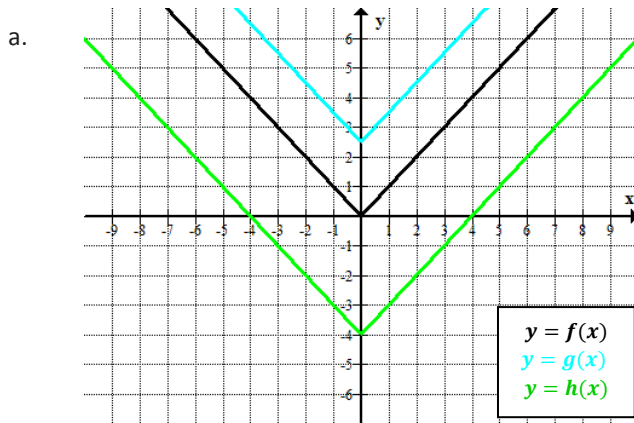


c.



Exercises 1–3

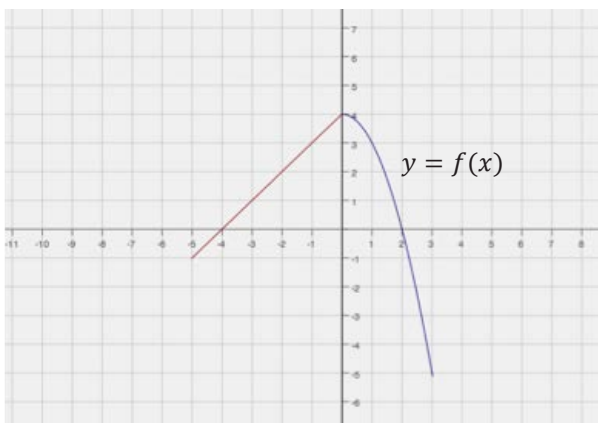
1. For each of the following graphs, use the formula for the parent function f to write the formula of the translated function.



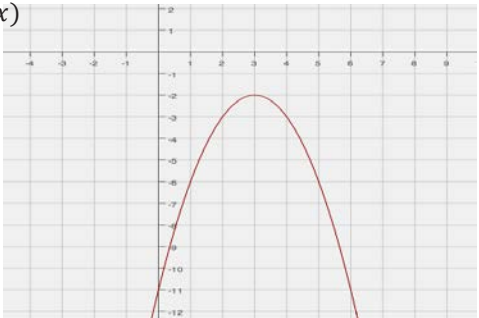
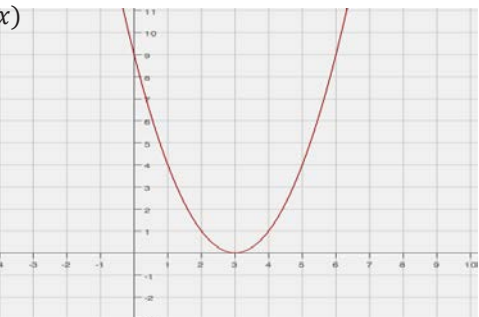
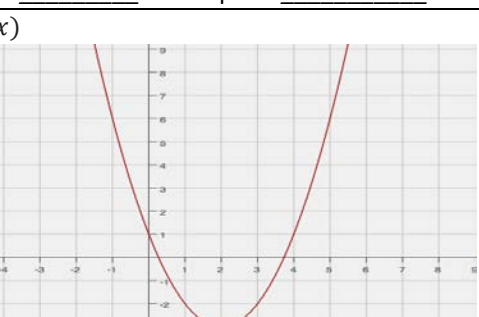
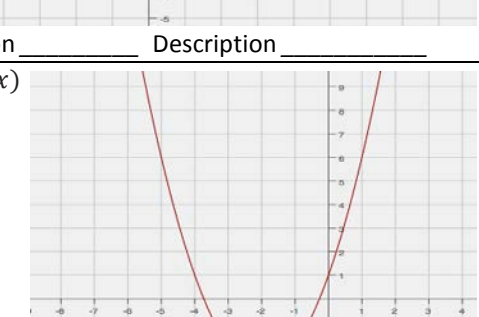
2. Below is a graph of a piecewise function f whose domain is $-5 \leq x \leq 3$. Sketch the graphs of the given functions on the same coordinate plane. Label your graphs correctly.

$$g(x) = f(x) + 3$$

$$h(x) = f(x - 4)$$



3. Match the correct equation and description of the function with the given graphs.

Graphs	Equation	Description
<p>$y = f(x)$</p>  <p>Equation _____ Description _____</p>	<p>E1. $y = (x - 3)^2$</p> <p>E2. $y = (x + 2)^2 - 3$</p> <p>E3. $y = -(x - 3)^2 - 2$</p> <p>E4. $y = (x - 2)^2 - 3$</p>	<p>D1. The graph of the parent function is translated down 3 units and left 2 units.</p> <p>D2. The graph of the function does not have an x-intercept.</p> <p>D3. The coordinate of the y-intercept is $(0, 1)$, and both x-intercepts are positive.</p> <p>D4. The graph of the function has only one x-intercept.</p>
<p>$y = g(x)$</p>  <p>Equation _____ Description _____</p>		
<p>$y = h(x)$</p>  <p>Equation _____ Description _____</p>		
<p>$y = p(x)$</p>  <p>Equation _____ Description _____</p>		

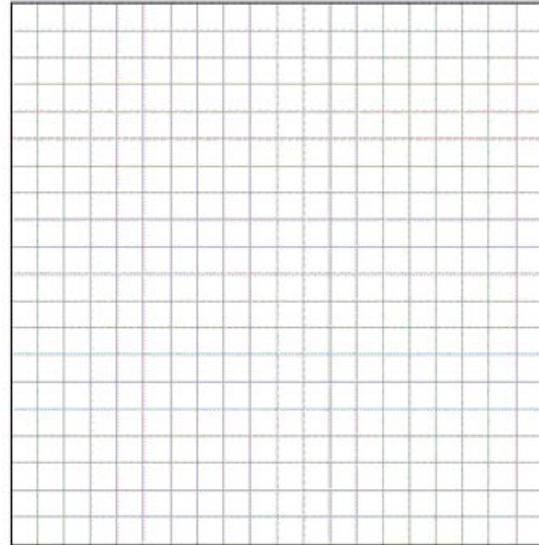
Problem Set

- Graph the functions in the same coordinate plane. Do not use a graphing calculator.

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

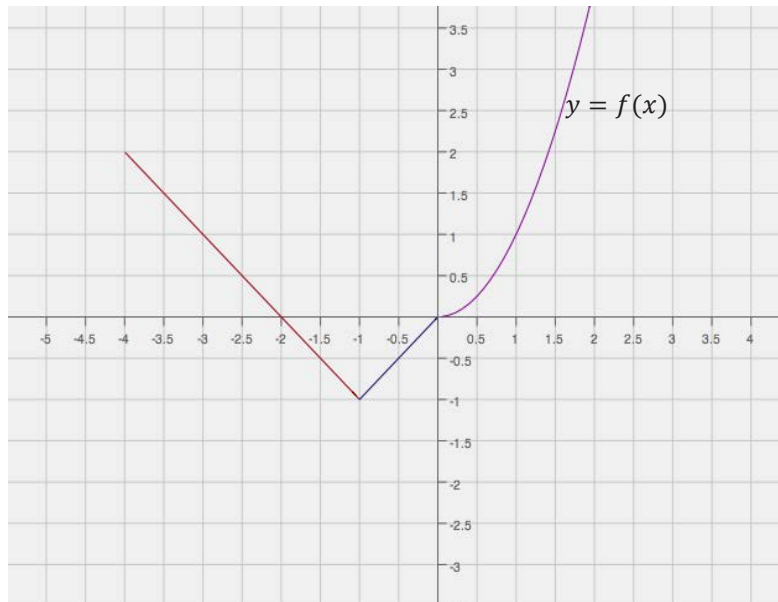
$$p(x) = 10 + \sqrt{x}$$

$$q(x) = \sqrt{x + 8}$$



- Write a function that translates the graph of the parent function $f(x) = x^2$ down 7.5 units and right 2.5 units.
- How would the graph of $f(x) = |x|$ be affected if the function were transformed to $f(x) = |x + 6| + 10$?
- Below is a graph of a piecewise function f whose domain is the interval $-4 \leq x \leq 2$. Sketch the graph of the given functions below. Label your graphs correctly.

$$g(x) = f(x) - 1 \quad h(x) = g(x - 2) \text{ (Be careful, this one might be a challenge.)}$$



5. Study the graphs below. Identify the parent function and the transformations of that function depicted by the second graph. Then, write the formula for the transformed function.

