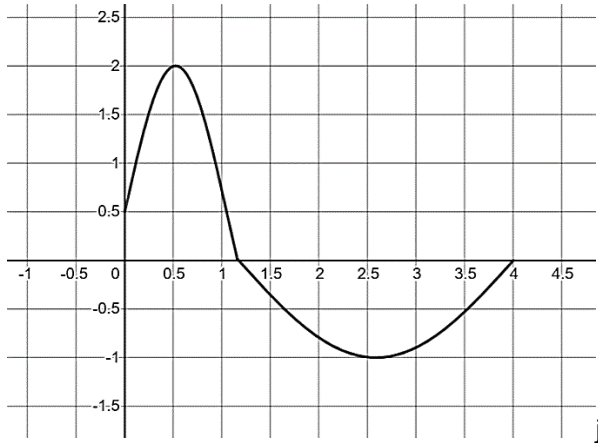**Functions**

Properties and parameters

1) The diving phase of a swimming race is very important. The following graph shows the height of a swimmer's hands in relation to the water's surface throughout this phase.

For this function, determine:

  a) domain and range   b) initial value   c) variation

  d) extrema   e) zeros   f) sign

2) Determine the value of parameters a, b, h, and k by comparing the rule of each of the following functions with the rule of the basic function of the same type.

a) $f(x) = 0.7\sqrt{-2(x + 4)}$ b) $g(x) = \frac{3}{x-9} + 6$ c) $h(x) = -2|2x + 4| - 3$
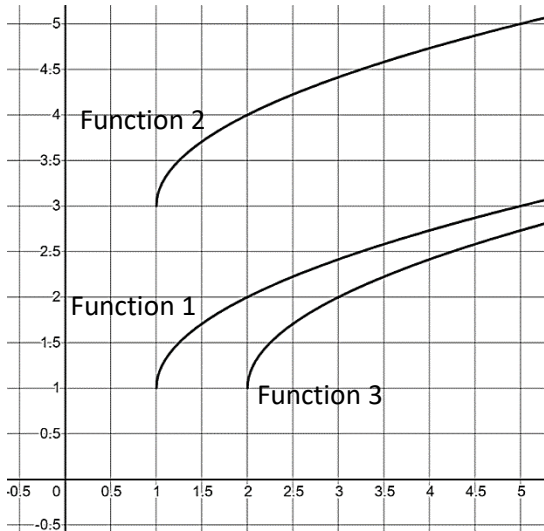
d) $j(x) = -3\sqrt{3x + 9} + 4$ e) $k(x) = \frac{4}{2x-10} - 8$ f) $l(x) = |x + 4|$
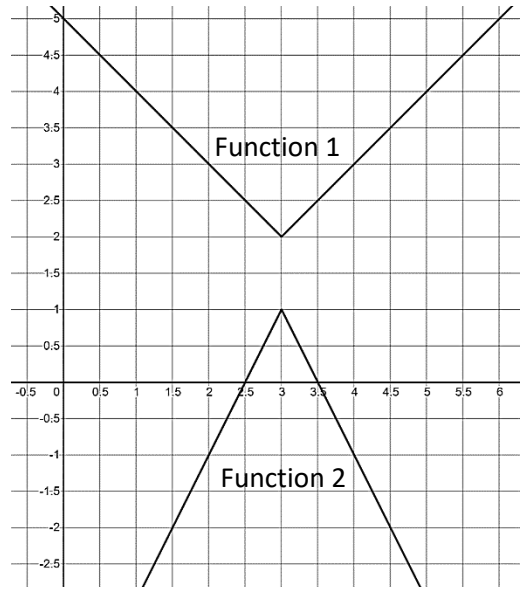
3) Given each original function, 1, and the transformed function (s) identify which parameter(s) need to modified to get from the original function to the modified function.
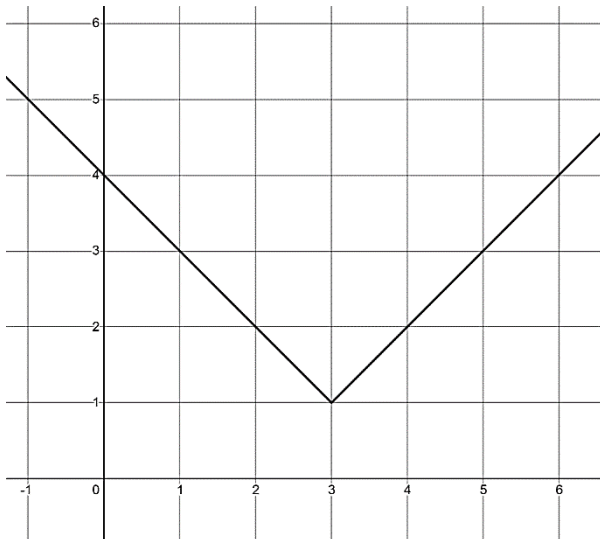
a)

b)

4) Given the function below, explain what would happen if a increased by 2, h increased by 3, and k increased by 1.
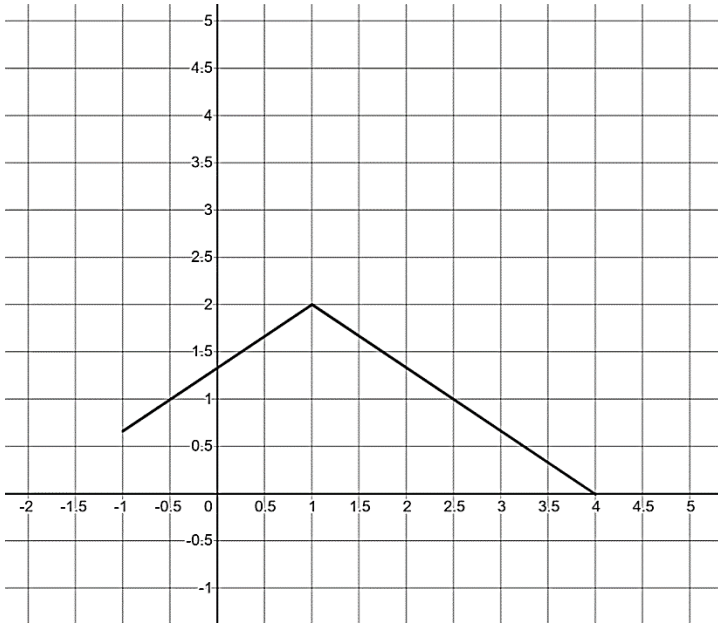
Inverse of Functions

5) For each of the functions represented in the graphs below
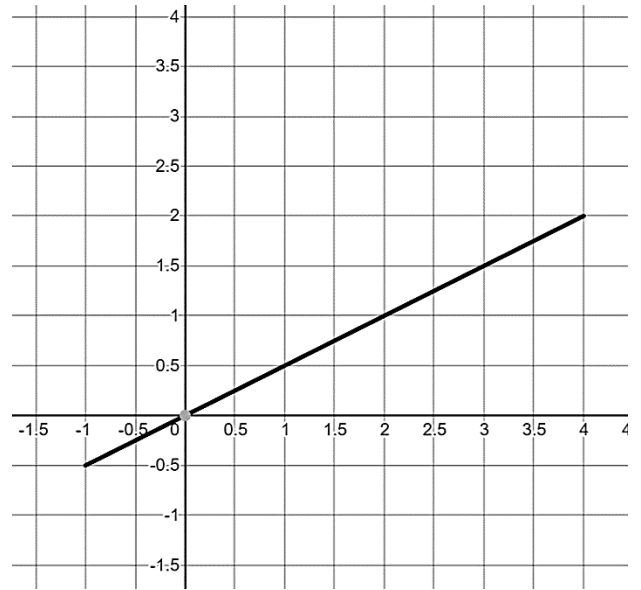
a) Describe the variation of the function
b) Graph the inverse of the function
c) What conjecture can you formulate with respect to the variation of a function and its inverse?
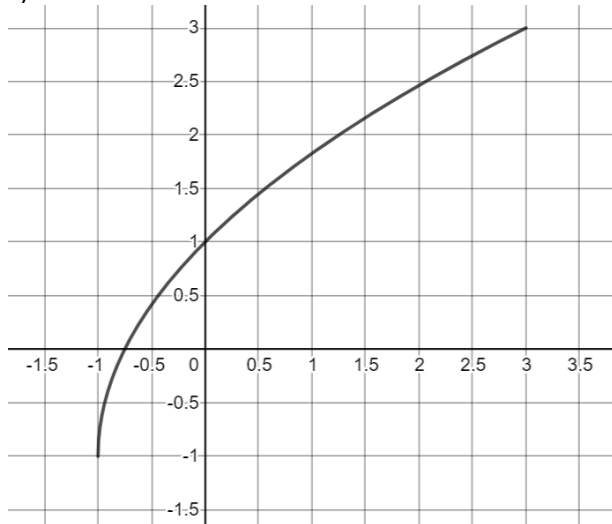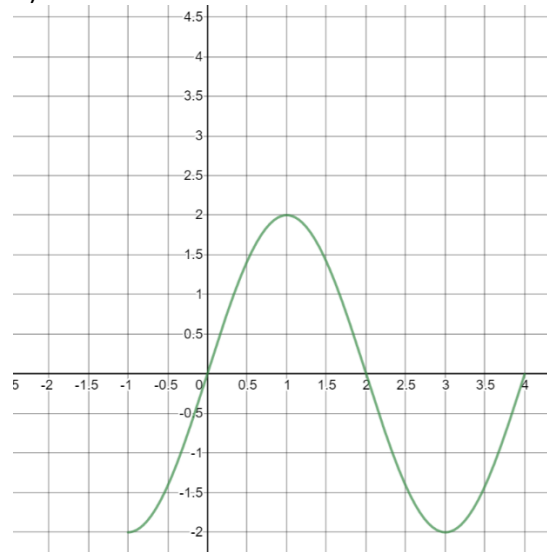
a)

b)

c)

d)

6) Write the inverse and indicate whether the inverse is a function
a) $R = \{(1,3),(2,4),(3,5),(4,8)\}$
b) $S = \{(-2,3),(-1,4),(0,0),(2,3),(3,4)\}$

7) If a function's rule is $y = 2x - 4$, what is the rule for its inverse?

8) Determine if the following pairs of functions are the inverse of one another.
a)

$$f(x) = 5x - 3 \text{ and } g(x) = \frac{x-3}{5}$$

b)

$$h(x) = x + 4 \text{ and } i(x) = x - 4$$

9) Given $f(x) = 4x - 2$, determine
a) $f(3)$
b) $f^{-1}(3)$

10) Determine the rule of the inverse of each of the following functions
a) $f(x) = 3x + 5$
b) $g(x) = \frac{2}{x} + 7$
c) $h(x) = \sqrt{9 - 2x}$

Operations and Composites

11) Considering the rules of functions f and g are $f(x) = 3x - 4$ and $g(x) = x^2 + 5$, calculate:

a) $(f + g)(3)$

b) $g(f(-1))$

c) $\left(\frac{g}{f}\right)(2)$

e) $(g - f)(10)$

f) $f(g(6))$

g) $f(f(2))$

12) The rules of functions f, g, and h are below.

$$f(x) = 3x^2 + 4 \qquad g(x) = -2x - 1 \qquad h(x)0.5x$$

Determine:

a) $f + g$

b) $g + f$

c) $(f + g) + h$

d) $f + (g + h)$

e) $f \times g$

f) $g \times f$

g) $(f \times g) \times h$

h) $f \times (g \times h)$

i) $g \circ f$

13) Consider the following two functions: $f(x) = (x - 4)^2 - 9$ and $g(x)$ is the inverse of $f(x)$

What is $f(g(x))$

14) The rules of functions f and g are $f(x) = \sqrt{x}$ and $g(x) = \frac{1}{x}$. Show that for f and g, $f \times g = g \circ f$

15) The rules of functions f and g are:

$$f(x) = \frac{x - 1}{2x - 3} \quad \text{and} \quad g(x) = \frac{3x - 1}{6x - 9}$$

Establish the rule of the function that corresponds to $f + g$