

# Assignment

## Write

Provide an example of each term.

1. square root function
2. cube root function
3. radical function
4. composition of functions

## Remember

Radical functions are inverses of even-degree power functions if the domain of the even-degree power function is restricted to  $x \geq 0$ .

For two functions  $f$  and  $g$ , the composition of functions uses the output of one function as the input of the other. If  $f(g(x)) = g(f(x)) = x$ , then  $f(x)$  and  $g(x)$  are inverse functions.

## Practice

Brian has a new beehive. The number of bees in the hive after  $x$  weeks can be modeled by the function  $b(x) = 36x^2$  for  $1 \leq x \leq 30$ .

1. Determine the corresponding range of  $b(x)$  for the given domain. Describe what the domain and range represent in this problem.
2. Sketch the function  $b(x)$  with the given domain restrictions.
3. Use the function  $b(x)$  to predict the bee population after 10 weeks.
4. Use the function  $b(x)$  to predict the bee population after 20 weeks.
5. Write the inverse function  $b^{-1}(x)$ .
6. Use compositions to verify that  $b(x)$  and  $b^{-1}(x)$  are inverse functions. Show your work.
7. Determine the domain and range of  $b^{-1}(x)$ . Describe what the domain and range represent in this problem.
8. Sketch the graph of the inverse function  $b^{-1}(x)$ .
9. Use the inverse function to determine when the bee population will be 25,000.

## Stretch

1. The number of ants in an ant population after  $x$  days can be modeled by the function  $a(x) = 20x^3$  for  $1 \leq x \leq 45$ .
  - a. Determine the corresponding range of  $a(x)$  for the given domain. Describe what the domain and range represent in this problem.
  - b. Use the function  $a(x)$  to predict the ant population after 15 days.
  - c. Write the inverse function  $a^{-1}(x)$ .
  - d. Use compositions to verify that  $a(x)$  and  $a^{-1}(x)$  are inverse functions. Show your work.
  - e. Determine the domain and range of  $a^{-1}(x)$ . Describe what the domain and range represent in this problem.
  - f. Use the inverse function to determine when the ant population will be 895,000.

2. Consider the functions  $f(x) = \sqrt{x}$ ,  $g(x) = \sqrt{x + 4}$ , and  $h(x) = \sqrt{x} + 4$ .

a. Complete the table.

$x$	$f(x)$	$g(x)$	$h(x)$
0			
4			
8			
16			

b. Graph  $f(x)$ ,  $g(x)$ , and  $h(x)$  on a coordinate plane.

c. How do the graphs of  $g(x)$  and  $h(x)$  compare to the graph of  $f(x)$ ? Explain your reasoning.

## Review

1. Consider the power function,  $f(x) = x^5$ .

a. Sketch the graph of  $f(x)$ .

b. Is  $f(x)$  invertible? Explain your reasoning.

c. If  $f(x)$  is invertible, sketch the graph of  $f^{-1}(x)$ .

2. Write a rational function with vertical asymptote  $x = -3$  and a horizontal asymptote at  $y = -5$ .

Sketch a graph of the function.

3. Use synthetic division to divide the given polynomials.

a.  $(x^3 + 13x^2 + 40x + 26) \div (x + 9)$

b.  $(x^4 - 8x^3 + 10x^2 + 2x + 4) \div (x - 2)$