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