

Lesson #7 D: Understanding Inverses and Finding the Inverse of Relations, Functions and Applications
(Reference: Lesson #50 in book)**Problem**

1. Find the algebraic inverse of each of the following algebraic relations.

1. $f(x) = \frac{2}{3}x^7 + 6$

2. $f(x) = \sqrt[3]{4x - 12} - 16$

3. $f(x) = \frac{\sqrt{x+6}}{2} - 4$

4. $f(x) = \frac{12}{x+3} - 10$

5. Find the inverse of each of the following relations and determine whether each relation is a function. If any inverse is not a function determine what restrictions can be placed on the domain of the original relation to make the inverse a function. (Graphing calculators can be used to help you graph the relations and determine whether or not they are functions.)

5. $f(x) = (3x + 12)^3 + 6$

6. $f(x) = \frac{(2x - 8)^2}{3} - 2$

7. $f(x) = \frac{8}{x+2} - 4$

8. Use what you have learned about inverses to help you solve each of the following inverse application problems.

8. The distance traveled by a boat over a period of time is modeled through the function $d = 8t^3 + 7$, where d is the distance traveled in miles and t is the time in hours. First find the inverse of the formula, then determine long it would take for the boar to travel 519 miles?

9. The formula to convert temperatures from degress Fahrenheit to degress Celsius is:

$$C = \frac{5}{9}(F - 32)$$

Find the inverse of the above formula, which would convert temperature from degrees Celsius to degrees Fahrenheit. Then find the Fahrenheit temperatures that are equal to $29^\circ C$, $10^\circ C$, and $0^\circ C$.

10. In bowling a handicap is a change in score to adjust for differences in players' abilities. You belong to a bowling league in which each bowler's handicap h is determined by his or her average a using this formula:
- $$h = 0.9(200 - a)$$
- (If the bowler's average is over 200, the handicap is 0.) Find the inverse of the function. Then find your average if your handicap is 27.

11. The weight w (in pounds) that can be supported by a shelf made from half-inch Douglas fir plywood can be modeled by

$$w = \left(\frac{82.9}{d} \right)^3$$

where d is the distance (in inches) between the supports for the shelf. Find the inverse of the function. Then find the distance between the supports of a shelf that can hold a set of encyclopedias weighing 66 pounds. (Round your answer to the nearest tenth.)

12. The volume of a cylinder is given by $v = \pi r^2 h$. A manufacturer wants a cylindrical container to have a volume of 1,728 cubic inches, and a height of 2 inches. Find the inverse function that gives r as a function of v , or $r(v)$, and find the required radius to the nearest tenth that allows them to stay within these restrictions.