

# INVERSE FUNCTIONS

**INVERSE FUNCTION  $f^{-1}$ :** If the function  $f$  is the set of ordered pairs  $(x,y)$ , then the inverse function  $f^{-1}$  is the set of ordered pairs  $(y,x)$  formed by reversing the ordered pairs of  $f$ , and if and only if the new set of ordered pairs fits the definition of a function.

**ONE-TO-ONE FUNCTION:** A function where each  $x$  value in the domain is assigned a different  $y$  value so that no two ordered pairs have the same second coefficient.

**HORIZONTAL LINE TEST:** Graph the function. If a line parallel to the  $x$ -axis intersects the graph at more than one point the equation is not a one-to-one function and its inverse is not a function.

## STEPS TO FIND AN INVERSE FUNCTION:

- 1) Start with a one-to-one function. Interchange  $x$  and  $y$  in the equation.
- 2) Solve the resulting equation for  $y$ , and then replace  $y$  with  $f^{-1}(x)$ .

Example:

Find the inverse function of  $f(x) = 2x + 3$ .

Some of this function's ordered pairs are  $(-1,1), (0,3), (1,5), (2,7)$ .

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|---------------------------------|-----------------------------|
| 1) Replace $f^{-1}(x)$ with $y$ | $y = 2x + 3$                |
| 2) Interchange $x$ and $y$      | $x = 2y + 3$                |
| 3) Solve for $y$                | $\frac{x-3}{2} = y$         |
| 4) Replace $y$ with $f^{-1}(x)$ | $f^{-1}(x) = \frac{x-3}{2}$ |

Some of the inverse function's ordered pairs are

$(1,-1), (3,0), (5,1), (7,2)$