

10.4 Inverse of a function

Inverse relation x and y and reversing them

In Exercises 1 and 2, find the inverse of the relation.

1. $(1, -1), (2, 5), (4, -2), (6, 8), (8, 9)$

$(-1, 1)$ $(5, 2)$ $(-2, 4)$ $(8, 6)$

2.

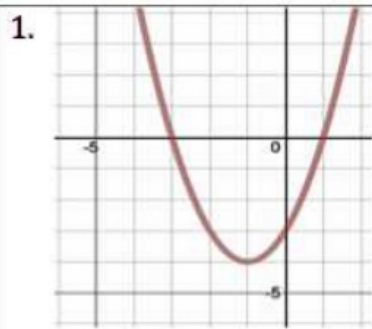
| | | | | | |
|--------|----|----|---|---|---|
| Input | -3 | -1 | 0 | 1 | 3 |
| Output | 4 | 2 | 2 | 5 | 3 |

| | | | | | |
|--------|----|----|---|---|---|
| Input | 4 | 2 | 2 | 5 | 3 |
| Output | -3 | -1 | 0 | 1 | 3 |

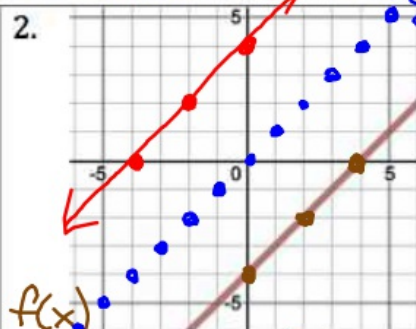
Horizontal Line Test

Inverse function $f^{-1}(x) \Rightarrow$ reflect over $y=x$ &

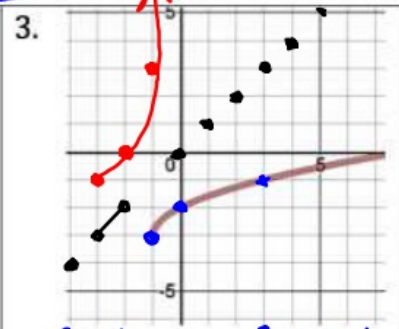
Determine if the relation is a function. If it is, graph its inverse function.



The inverse is not a function doesn't pass the horizontal line test



| $f(x)$ | | $f^{-1}(x)$ | |
|--------|----|-------------|---|
| x | y | x | y |
| 0 | 4 | -4 | 0 |
| 2 | -2 | -2 | 2 |
| 4 | 0 | 0 | 4 |



| $f(x)$ | | $f^{-1}(x)$ | |
|--------|----|-------------|----|
| x | y | x | y |
| -1 | -3 | -3 | -1 |
| 0 | -2 | -2 | 0 |
| 3 | -1 | -1 | 3 |

Find the inverse of the function.

Step 1 Set y equal to $f(x)$.

Step 2 Switch x and y in the equation.

Step 3 Solve the equation for y .

Step 4 Replace y with $f^{-1}(x)$

| | | |
|---|---|---|
| <p>1. $f(x) = x + 3$ $y = x + 3$ $x = y + 3$ $-3 \quad -3$ $x - 3 = y$ $f^{-1}(x) = x - 3$</p> | <p>2. $f(x) = 3x - 2$ $y = 3x - 2$ $x = 3y - 2$ $x + 2 = 3y$ $y = \frac{x + 2}{3}$ $f^{-1}(x) = \frac{x + 2}{3}$</p> | <p>3. $f(x) = 4x^2, x \geq 0$ $y = 4x^2$ $x = \sqrt{4y}$ $y = \sqrt{\frac{x}{4}}$ $f^{-1}(x) = \frac{\sqrt{x}}{2}$</p> |
|---|---|---|

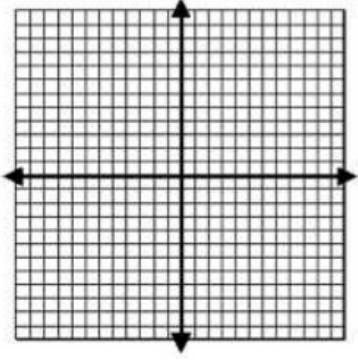
Find the inverse of the function. Then graph the function and its inverse.

Step 1 Graph $f(x)$

Step 2 Graph $y=x$

Step 3 Find $f^{-1}(x)$

Step 4 Graph the $f^{-1}(x)$ and check

| <p>1. $f(x) = 3x - 1$ $m = 3 \uparrow$ $(0, -1)$ <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><th>x</th><th>y</th></tr> <tr><td>-1</td><td>-4</td></tr> <tr><td>0</td><td>-1</td></tr> <tr><td>1</td><td>2</td></tr> </table> $f^{-1}(x)$ <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><th>x</th><th>y</th></tr> <tr><td>-4</td><td>-1</td></tr> <tr><td>-1</td><td>0</td></tr> <tr><td>2</td><td>1</td></tr> </table> </p> | x | y | -1 | -4 | 0 | -1 | 1 | 2 | x | y | -4 | -1 | -1 | 0 | 2 | 1 | <p>2. $f(x) = \frac{1}{2}x + 2$</p>  |
|--|----|---|----|----|---|----|---|---|---|---|----|----|----|---|---|---|--|
| x | y | | | | | | | | | | | | | | | | |
| -1 | -4 | | | | | | | | | | | | | | | | |
| 0 | -1 | | | | | | | | | | | | | | | | |
| 1 | 2 | | | | | | | | | | | | | | | | |
| x | y | | | | | | | | | | | | | | | | |
| -4 | -1 | | | | | | | | | | | | | | | | |
| -1 | 0 | | | | | | | | | | | | | | | | |
| 2 | 1 | | | | | | | | | | | | | | | | |

