

Review Exercise Set 6

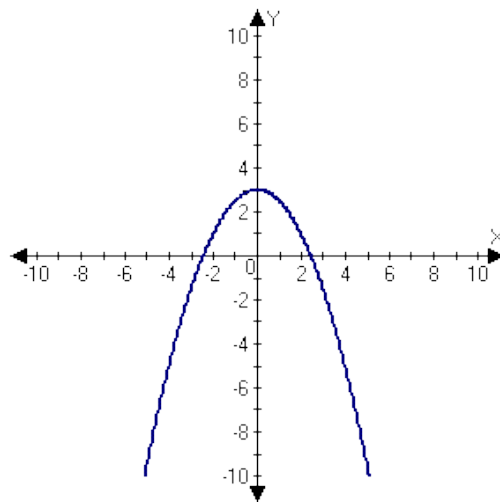
Exercise 1: Determine if the given functions are inverses of each other.

$$f(x) = 3x + 1 \text{ and } g(x) = \frac{x-1}{3}$$

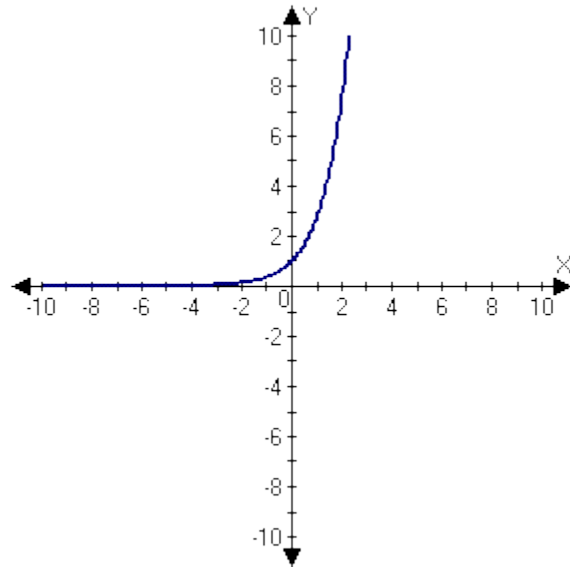
Exercise 2: Find an equation for the inverse of the given function.

$$f(x) = \frac{x}{3x-6}$$

Exercise 3: Determine if the function in the graph below has an inverse function.



Exercise 4: Use the graph of $f(x)$ to graph its inverse.



Exercise 5: Find the inverse of the given function with the stated domain restriction.

$$f(x) = 3(x + 1)^2 - 1; \text{ where } x \geq -1$$

Review Exercise Set 6 Answer Key

Exercise 1: Determine if the given functions are inverses of each other.

$$f(x) = 3x + 1 \text{ and } g(x) = \frac{x-1}{3}$$

Check if $f[g(x)] = x$

$$f[g(x)] = x$$

$$f\left[\frac{x-1}{3}\right] = x$$

$$3\left(\frac{x-1}{3}\right) + 1 = x$$

$$x - 1 + 1 = x$$

$$x = x$$

Check if $g[f(x)] = x$

$$g[f(x)] = x$$

$$g[3x+1] = x$$

$$\frac{(3x+1)-1}{3} = x$$

$$\frac{3x}{3} = x$$

$$x = x$$

$f(x)$ and $g(x)$ are inverse functions

Exercise 2: Find an equation for the inverse of the given function.

$$f(x) = \frac{x}{3x-6}$$

Replace $f(x)$ with y

$$y = \frac{x}{3x-6}$$

Exercise 2 (Continued):

Switch x and y

$$x = \frac{y}{3y-6}$$

Solve for y

$$x(3y-6) = \frac{y}{3y-6} (3y-6)$$

$$3xy - 6x = y$$

$$3xy - y = 6x$$

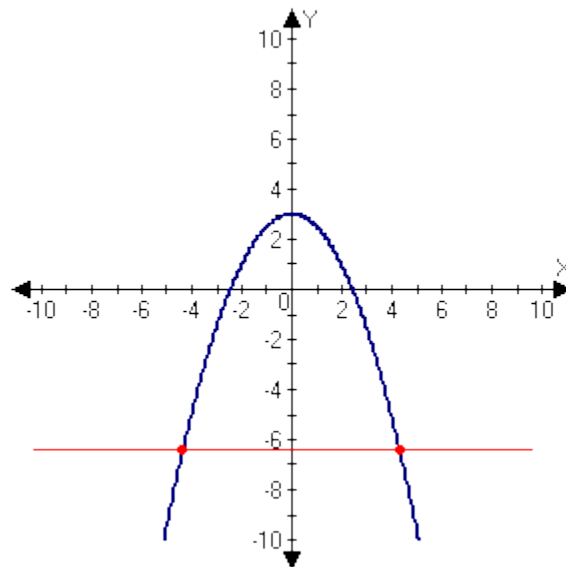
$$y(3x-1) = 6x$$

$$y = \frac{6x}{3x-1}$$

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

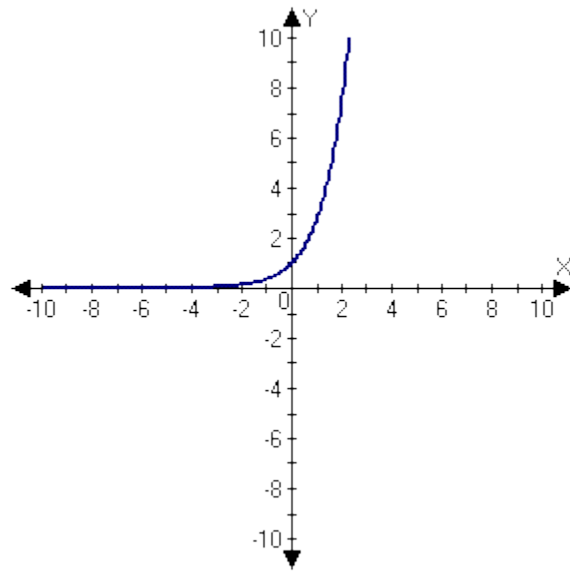
$$f^{-1}(x) = \frac{6x}{3x-1}$$

Exercise 3: Determine if the function in the graph below has an inverse function.

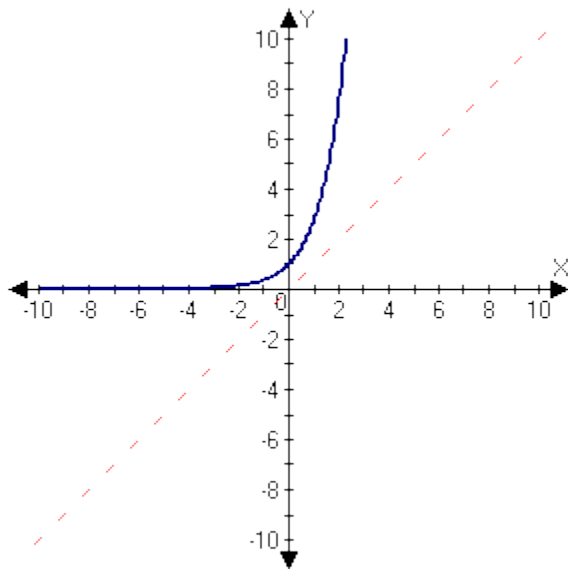


The function does not have an inverse because it fails the horizontal line test.

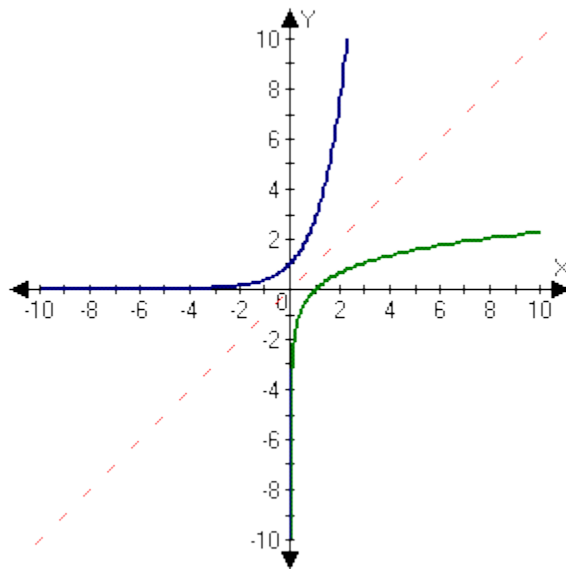
Exercise 4: Use the graph of $f(x)$ to graph its inverse.



Graph the diagonal line $y = x$



Reflect the function across the diagonal line



Exercise 5: Find the inverse of the given function with the stated domain restriction.

$$f(x) = 3(x + 1)^2 - 1; \text{ where } x \geq -1$$

Replace $f(x)$ with y

$$y = 3(x + 1)^2 - 1; \text{ where } x \geq -1$$

Switch x and y

$$x = 3(y + 1)^2 - 1; \text{ where } y \geq -1$$

Solve for y

$$\begin{aligned} x + 1 &= 3(y + 1)^2 \\ \frac{x + 1}{3} &= (y + 1)^2 \end{aligned}$$

Since y must be greater than or equal to -1 take only the principal square root

$$\begin{aligned} \sqrt{\frac{x + 1}{3}} &= y + 1 \\ \sqrt{\frac{x + 1}{3}} - 1 &= y \end{aligned}$$

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

$$f^{-1}(x) = \sqrt{\frac{x + 1}{3}} - 1$$