

*re-write $f(x)$ as y

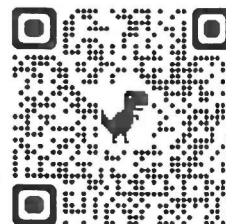
- switch x and y

- solve for y

* re-write as $f^{-1}(x)$ if necessary

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Algebra II



Finding the Inverse of a Function Algebraically

1. What is the inverse of the function $y = 2x - 3$?

$$\begin{aligned} x &= 2y - 3 \\ +3 & \quad +3 \\ x + 3 &= 2y \\ \frac{x+3}{2} &= \frac{2y}{2} \end{aligned} \quad \rightarrow \quad \frac{1}{2}x + \frac{3}{2} = y$$

2. Find the inverse of $y = 3x + 2$.

$$\begin{aligned} x &= 3y + 2 \\ -2 & \quad -2 \\ x - 2 &= 3y \\ \frac{x-2}{3} &= \frac{3y}{3} \end{aligned} \quad \rightarrow \quad \frac{1}{3}x - \frac{2}{3} = y$$

3. If $f(x) = 5x - 7$, find $f^{-1}(x)$

$$\begin{aligned} y &= 5x - 7 \\ x &= 5y - 7 \\ +7 & \quad +7 \end{aligned} \quad \rightarrow \quad \frac{x+7}{5} = \frac{5y}{5} \quad \rightarrow \quad \frac{1}{5}x + \frac{7}{5} = y \quad \rightarrow \quad f^{-1}(x) = \frac{1}{5}x + \frac{7}{5}$$

4. What is $g^{-1}(x)$ if $g(x) = 3x + 6$

$$\begin{aligned} y &= 3x + 6 \\ x &= 3y + 6 \\ -6 & \quad -6 \end{aligned} \quad \rightarrow \quad \frac{x-6}{3} = \frac{3y}{3} \quad \rightarrow \quad \frac{1}{3}x - 2 = y$$

$$g^{-1}(x) = \frac{1}{3}x - 2$$

5. What is the inverse of $y = \frac{1}{2}x + 2$?

$$2(x - 4) = y + 4$$

$$\begin{aligned} 2x &= y + 4 \\ -4 & \quad -4 \end{aligned}$$

$$2x - 4 = y$$

6. If $f(x) = x^2$, find $f^{-1}(x)$

$$y = x^2$$

$$\sqrt{x} = \sqrt{y^2}$$

$$y = \sqrt{x}$$

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

7. What is $h^{-1}(x)$ if $h(x) = x^2 + 2$

$$y = x^2 + 2$$

$$x = y^2 + 2$$

$$-2 \quad -2$$

$$\sqrt{x-2} = \sqrt{y^2}$$

$$\sqrt{x-2} = y$$

$$h^{-1}(x) = \sqrt{x-2}$$

8. Given $f(x) = \frac{2}{3}x + 6$, write the equation of $f^{-1}(x)$.

$$y = \frac{2}{3}x + 6$$

$$3(y-6) = 2x$$

$$3y - 18 = 2x$$

$$3x = 2y + 18$$

$$-18 \quad -18$$

$$3x - 18 = 2y$$

$$\frac{3x - 18}{3} = \frac{2y}{3}$$

$$\frac{3}{2}x - 9 = y$$

$$f^{-1}(x) = \frac{3}{2}x - 9$$

9. What is the inverse of the function $y = 4x + 5$?

$$x = 4y + 5$$

$$-5 \quad -5$$

$$x - 5 = 4y$$

$$\frac{x-5}{4} = \frac{4y}{4}$$

$$\frac{1}{4}x - \frac{5}{4} = y$$

10. What is the inverse of $f(x) = -6(x - 2)$?

$$y = -6(x-2)$$

$$x = -6(y-2)$$

$$x = -6y + 12$$

$$-12 \quad -12$$

$$x - 12 = -6y$$

$$\frac{x-12}{-6} = \frac{-6y}{-6}$$

$$-\frac{1}{6}x + 2 = y$$

$$f^{-1}(x) = -\frac{1}{6}x + 2$$