

2.8 Inverse Functions

EX:  $y = 2x + 3$  ;  $y = \frac{x-3}{2}$

**Inverse of a function:** Undoes the actions of another function.

Steps to Finding the Inverse Function	Fun Facts About Inverses
1. <u>Change</u> $f(x)$ to $y$ .	Suppose $f(x)$ and $g(x)$ are inverse functions then...  $f(g(x)) = g(f(x)) = x$ .  $f(x)$ and $g(x)$ are reflections of each other in the line $y=x$ .  we claim that $g(x)$ is $f^{-1}(x)$ which means "f inverse" or "the inverse of f"
2. <u>Swap</u> $x$ and $y$ (meaning $x$ becomes $y$ and $y$ becomes $x$ ).	
3. <u>Solve</u> for $y$ .	
4. Change $y =$ to $f^{-1}(x) =$ (this is the notation for the inverse of $f$ )	

Find the inverse function for the following functions. Remember undo operations!!

<p>1. <math>f(x) = -3x - 1</math></p> <p>Step 1: <math>y = -3x - 1</math></p> <p>Step 2: <math>x = -3y - 1</math></p> <p>Step 3: <math>+1</math> <math>+1</math></p> $\frac{x+1}{-3} = \frac{-3y}{-3}$ $y = \frac{x+1}{-3}$ <p>Step 4: <math>f^{-1}(x) = \frac{x+1}{-3}</math></p>	<p>2. <math>f(x) = 5 - 2x</math></p> $y = 5 - 2x$ $x = 5 - 2y$ $\frac{x-5}{-2} = \frac{-2y}{-2}$ $\frac{x-5}{-2} = y$ $f^{-1}(x) = \frac{x-5}{-2}$
<p>3. <math>g(x) = -3 + x^3</math></p> $y = -3 + x^3$ $x = -3 + y^3$ $+3$ $+3$ $x+3 = y^3$ $\sqrt[3]{x+3} = \sqrt[3]{y^3}$ $y = \sqrt[3]{x+3}$ <p><math>g^{-1}(x) = \sqrt[3]{x+3}</math></p>	<p>4. <math>h(x) = \sqrt{x+7}</math></p> $y = \sqrt{x+7}$ $x = \sqrt{y+7}$ $x^2 = (\sqrt{y+7})^2$ $x^2 = y+7$ $-7$ $-7$ $y = x^2 - 7$ <p><math>h^{-1}(x) = x^2 - 7</math></p>
<p>5. <math>f(x) = \frac{1}{x-2} - 1</math></p> $y = \frac{1}{x-2} - 1$ $x = \frac{1}{y-2} - 1$ $+1$ $+1$ $x+1 = \frac{1}{y-2}$ $y-2 = \frac{1}{x+1}$ $+2$ $+2$ $y = \frac{1}{x+1} + 2$ <p><math>f^{-1}(x) = \frac{1}{x+1} + 2</math></p> <p>NOTE: <math>a = \frac{b}{c}</math> equivalent to <math>c = \frac{b}{a}</math></p>	<p>6. <math>g(x) = -\frac{1}{x+3} - 5</math></p> $y = -\frac{1}{x+3} - 5$ $x = -\frac{1}{y+3} - 5$ $+5$ $+5$ $x+5 = -\frac{1}{y+3}$ $y+3 = \frac{-1}{x+5}$ $-3$ $-3$ $y = \frac{-1}{x+5} - 3$ <p><math>g^{-1}(x) = \frac{-1}{x+5} - 3</math></p>

Undo Operations:

+ and -	× and ÷	$\square^2$ and $\sqrt{\square}$	$\square^3$ and $\sqrt[3]{\square}$
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