Integrated Math 3
Unit 6: Polynomials
6.14

Name: ______________________

Date: __________ Period: ______

Objective: To find inverses of functions.

Warm-up: Explain how to solve $5x^2 - 7x + 6 = \frac{1}{2}x^4 - 7$ on a graphing calculator.

1. Enter $5x^2 - 7x + 6$ into Y_1
2. Enter $\frac{1}{2}x^4 - 7$ into Y_2
3. $2^{nd} \to$ Calc $\to$ Intersect
4. Press enter three times
5. Record the x-value as the Solution
6. Repeat as necessary

What is an inverse function?

An inverse function is a function that "reverses" another function. That is, if *f* is a function mapping *x* to *y*, then the inverse function of *f* maps *y* back to *x*.

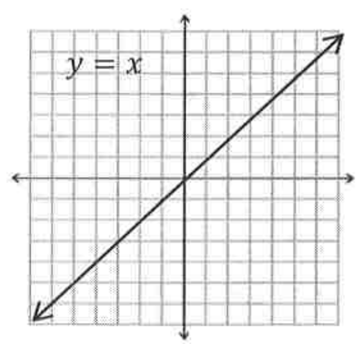
Inverse functions are labeled with a -1 exponent as a matter of notation. Confusingly, this has nothing to do with raising the function to the -1 power.

Examples: $f(x) = 2x,\ f^{-1}(x) = \frac{x}{2};\quad g(x) = x + 3, g^{-1}(x) = x - 3;\quad h(x) = x^3, h^{-1}(x) = \sqrt[3]{x}$

How do we know two functions are inverses of each other?

Inverse functions can be verified both algebraically and graphically. We will focus on how to verify graphically.

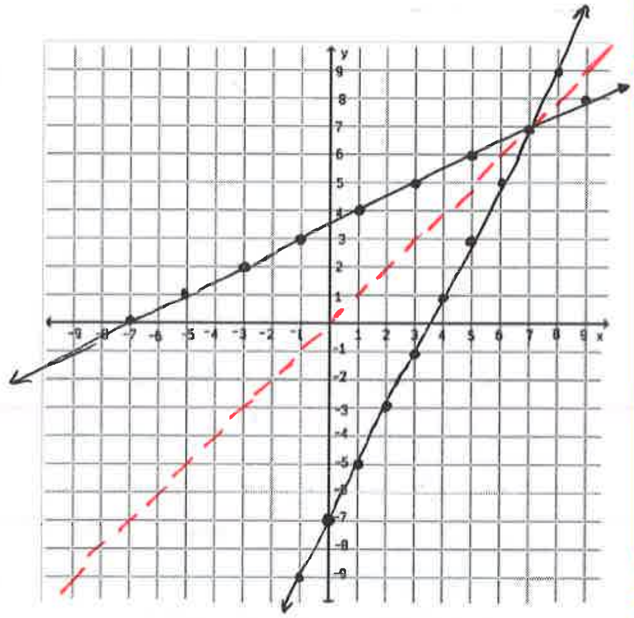
If functions are inverses of each other, they will be each other's reflections over the line $y = x$. See graph on the right.



Steps for finding an inverse function

- Change the function notation to $y=$ (f(x))
- Switch x and y
- Solve for y (get *y* alone/isolated)
- Rewrite *y* using function notation $(f^{-1}(x))$

Example 1: Find the inverse of $f(x) = 2x - 7$. Then graph them both.



$y = 2x - 7$

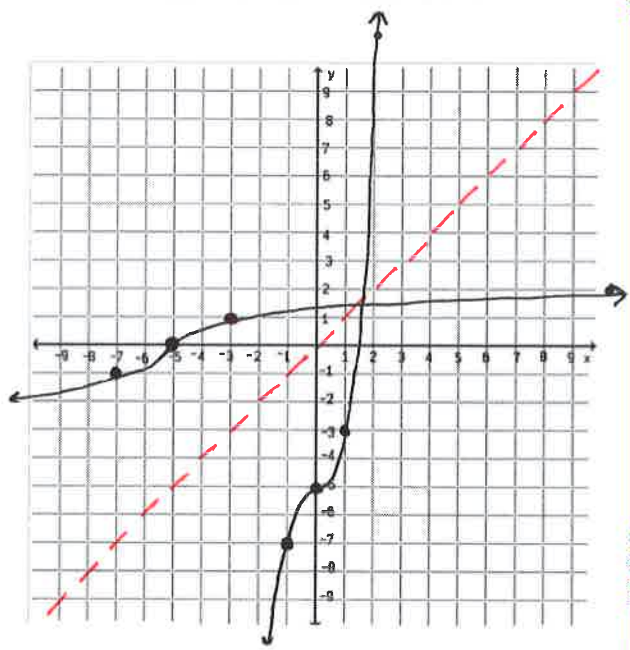
$x = 2y - 7$
$+7 \quad +7$

$\frac{x+7}{2} = \frac{2y}{2}$

$\frac{x+7}{2} = y$

$\boxed{f^{-1}(x) = \frac{x+7}{2}}$

Example 2: Find the inverse of $g(x) = 2x^3 - 5$. Then graph them both.



$y = 2x^3 - 5$

$x = 2y^3 - 5$
$+5 \quad +5$

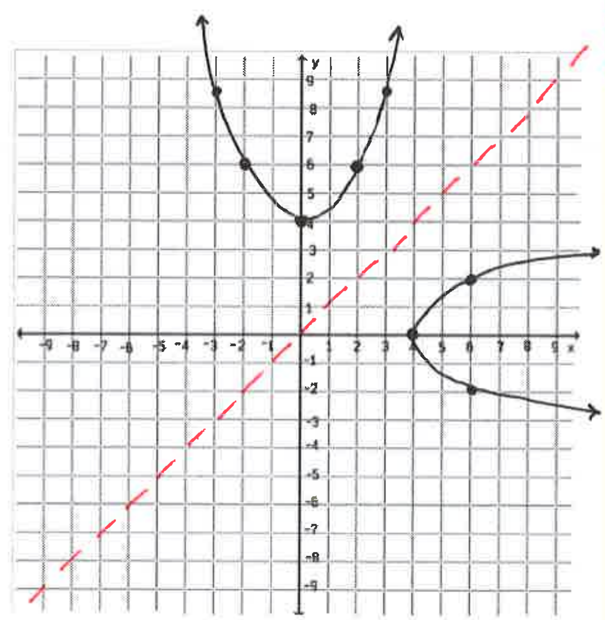
$\frac{x+5}{2} = \frac{2y^3}{2}$

$\sqrt[3]{\frac{x+5}{2}} = \sqrt[3]{y^3}$

$\sqrt[3]{\frac{x+5}{2}} = y$

$\boxed{g^{-1}(x) = \sqrt[3]{\frac{x+5}{2}}}$

Example 3: Find the inverse of $h(x) = \frac{1}{2}x^2 + 4$. Then graph them both.



$y = \frac{1}{2}x^2 + 4$

$x = \frac{1}{2}y^2 + 4$
$-4 \quad -4$

$2(x-4) = 2(\frac{1}{2}y^2)$

$\pm\sqrt{2(x-4)} = \sqrt{y^2}$

$\pm\sqrt{2(x-4)} = y$

$\boxed{h^{-1}(x) = \pm\sqrt{2(x-4)}}$