Inverse Functions

- From an equation
- On a graph

- In an INVERSE f^n, x and y trade places. Or, the domain becomes the range and the range becomes the domain.

If for $f(x)$, $D = x \geq 3$
$R = \mathbb{R}$

Then $f^{-1}(x)$; $D = \mathbb{R}$
$R = y \geq 3$

- Almost always, a negative exponent means take the reciprocal. $x^{-1} = \frac{1}{x}$
- F^n notation is the EXCEPTION

$$f^{-1}(x) \neq \frac{1}{f(x)}$$

$f^{-1}(x)$ means find the Inverse function.

ALGEBRAICALLY

Steps

(1) Replace f(x) with y.

(2) Replace every x with a y and every y with an x

(3) Solve for y again

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

Example

$f(x) = 3x - 7$

① $y = 3x - 7$

② $x = 3y - 7$

③ $x = 3y - 7$

$+7 \quad +7$

$\frac{x+7}{3} = \frac{3y}{3}$

$y = \frac{x+7}{3}$ or $\frac{1}{3}x + \frac{7}{3}$

④ $f^{-1}(x) = \frac{x+7}{3}$

Example #2

$$f(x) = \frac{3x-7}{2x+1}$$

① $y = \frac{3x-7}{2x+1}$

② $x = \frac{3y-7}{2y+1}$

③ $(2y+1)x = \frac{(3y-7)(2y+1)}{(2y+1)}$

$(2y+1)x = (3y-7)$

$2xy + x = 3y - 7$

$-3y \quad -3y$

$2xy - 3y + x = -7$

$-x \quad -x$

Factor

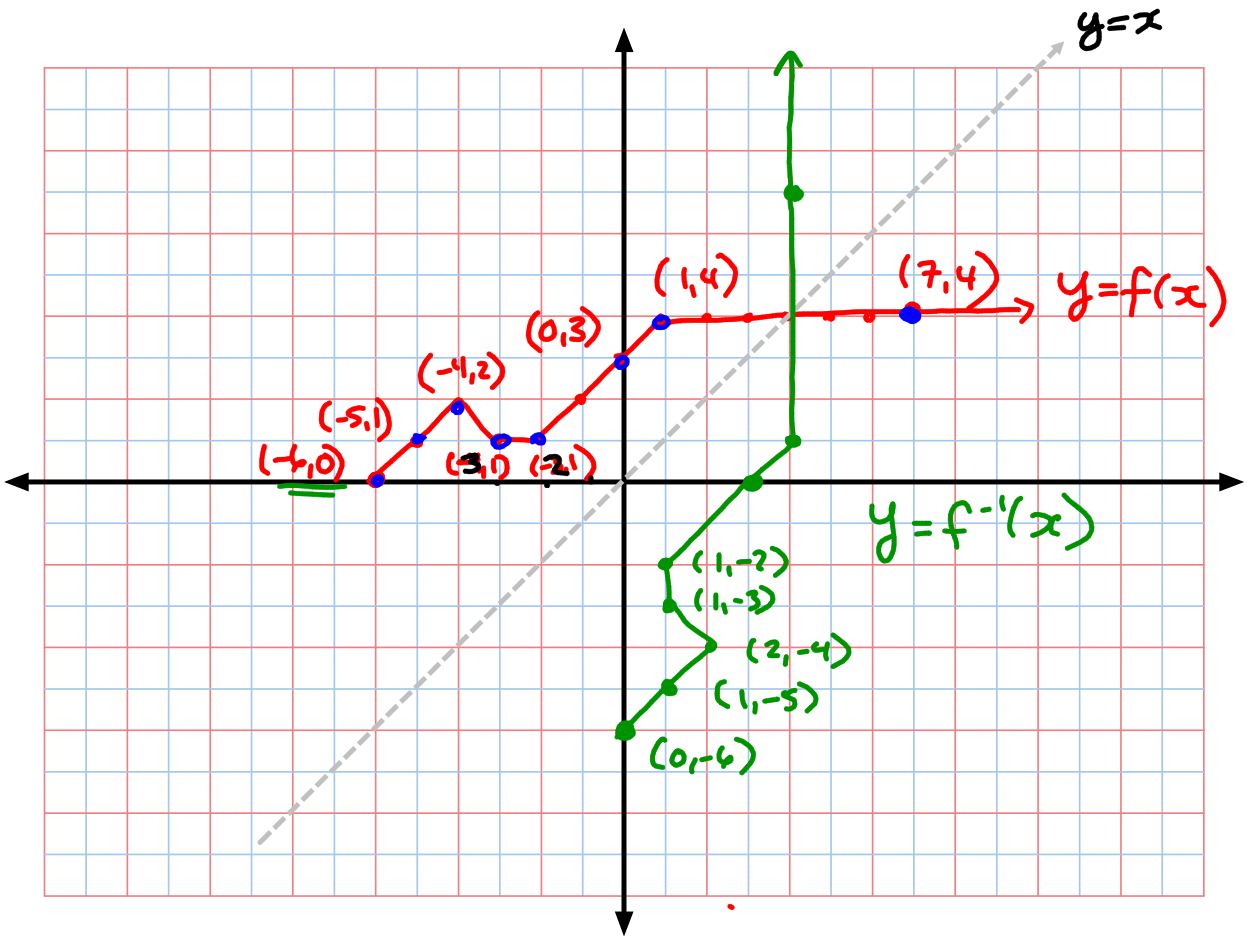
$2xy - 3y = -x - 7$

$\frac{y(2x-3)}{(2x-3)} = \frac{(-x-7)}{(2x-3)}$

$y = \frac{(-x-7)}{(2x-3)} = -\frac{x+7}{2x-3}$

$y =$ _____

④ $f^{-1}(x) = \frac{-x-7}{2x-3}$



- x & y trade places
- $f^{-1}(x)$ is a REFLECTION of $f(x)$ across the line $y = x$