

# MA 109: September 1

Inverse Functions

Start of Class

Instructor Information

Name:

Email:

Office Hours:

Warm-up Questions

## Notes

↙ "f inverse of -7"

Example: Suppose  $f(x) = \frac{2x-1}{3x+5}$ . What is  $f^{-1}(-7)$ ?

inverses swap inputs and outputs, so -7 is the output to  $f(x)$ :

$$(3x+5) \frac{2x-1}{3x+5} = -7(3x+5)$$

problem: x's in denominator

$$2x-1 = -7(3x+5)$$

$$\begin{array}{r} 2x-1 = -21x-35 \\ +21x \quad \quad +21x \end{array}$$

problem: x's on both sides of =

$$\begin{array}{r} 23x-1 = -35 \\ +1 \quad \quad +1 \end{array}$$

$$\frac{23x}{23} = \frac{-34}{23}$$

$$x = \boxed{\frac{-34}{23}}$$

answer

Example: Suppose  $f(x) = \frac{2x-1}{3x+5}$ . What is  $f^{-1}(x)$ ?

no number input, so looking for a formula

Strategy: (1) write  $y = f(x)$   
(2) swap  $x$  and  $y$   
(3) solve for  $y$

$$(1) \quad y = \frac{2x-1}{3x+5}$$

$$(2) \quad x = \frac{2y-1}{3y+5}$$

$$(3) \quad (3y+5)x = \frac{2y-1}{3y+5} (3y+5)$$

$$(3y+5)x = 2y-1$$

$$3xy + 5x = 2y - 1$$

$$3xy - 2y + 5x = -1$$

"un-distribute"

$$y(3x-2) + 5x = -1$$

$$\frac{y(3x-2)}{3x-2} = \frac{-1-5x}{3x-2}$$

Answer

$$f^{-1}(x) = \frac{-1-5x}{3x-2}$$

## End of Class

Write a summary of what you learned today:

What questions do you have about the material from today?

What do you need to do between now and the next class meeting?