Today's Plan:

Learning Target (standard): I will find the inverse of a function and verify that it is indeed the inverse function.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

$g(x) = -\frac{3}{x-3} + 1$ 1-1 ✓

$y = -\frac{3}{x-3} + 1$

$x = -\frac{3}{y-3} + 1$

$x - 1 = -\frac{3}{y-3}$

$(y-3)(x-1) = -3$

$y - 3 = \frac{-3}{x-1}$

$y = -\frac{3}{x-1} + 3$

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

$g(x) = \frac{3}{x} - 2$ 1-1 ✓

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

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

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

$y(x+2) = 3$

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

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

Find the inverse function, if it exists.

$f(x) = 5x - 3$ 1-1 ✓

$y = 5x - 3$

$x = 5y - 3$

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

$y = \frac{1}{5}x + \frac{3}{5}$

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

Find the inverse function, if it exists.

$$f(x)=\frac{2x-3}{x+1}$$ 1-1 ✓

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

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

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

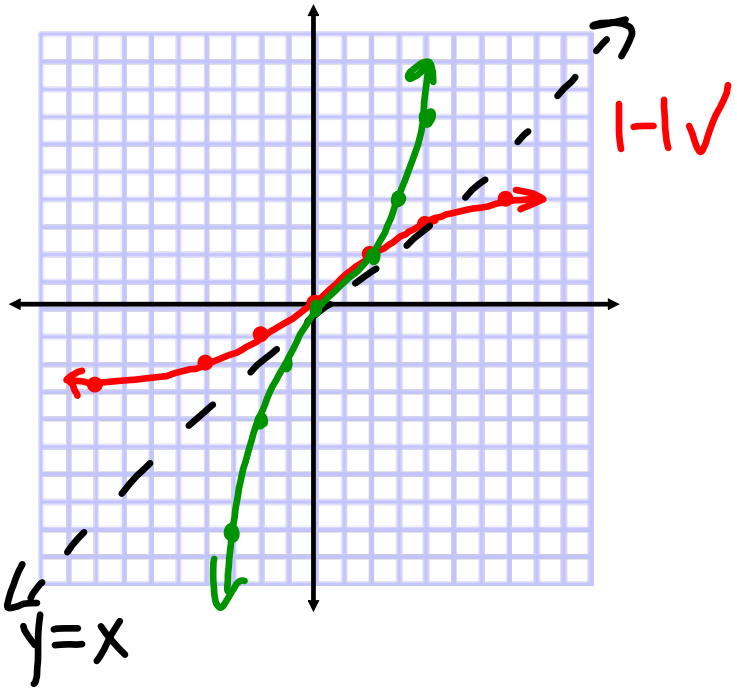
$$xy-2y=-x-3$$

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

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

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

Graph the inverse function:



Verify that the given functions are inverses of one another:

(look @ notes for a hint - do NOT find an inverse!)

$f(x) = 3x + 4$

$g(x) = \frac{1}{3}x - \frac{4}{3}$

① $f(g(x)) = 3\left(\frac{1}{3}x - \frac{4}{3}\right) + 4$

$= x - 4 + 4$

$f(g(x)) = x$ ✓

$g(f(x)) = \frac{1}{3}(3x+4) - \frac{4}{3}$

$= x + \frac{4}{3} - \frac{4}{3}$

$g(f(x)) = x$ ✓

∴ They are inverses because $f(g(x)) = x$ and $g(f(x)) = x$.

Verify that the given functions are inverses of one another:

$f(x) = x^3 - 8$

$g(x) = \sqrt[3]{x+8}$

$f(g(x)) = \left(\sqrt[3]{x+8}\right)^3 - 8$

$= x + 8 - 8$

$f(g(x)) = x$ ✓

$g(f(x)) = \sqrt[3]{x^3 - 8 + 8}$

$= \sqrt[3]{x^3}$

$g(f(x)) = x$ ✓

∴ They are inverses because $f(g(x)) = x$ <u>and</u> $g(f(x)) = x$.

① Find the inverse function. ② Verify your answer. Determine the domain and ③ range of each:

$$f(x)=\frac{1}{x-2}$$ 1-1 ✓

③ D: $\{x \mid x \neq 2\}$

R: $\{y \mid y \neq 0\}$

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

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

$x(y-2)=1$

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

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

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

③ D: $\{x \mid x \neq 0\}$

R: $\{y \mid y \neq 2\}$

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

$=\dfrac{1}{\frac{1}{x}}$

$f(f^{-1}(x))=x$ ✓

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

$=x-2+2$

$f^{-1}(f(x))=x$ ✓

∴ $f(x)$ and $f^{-1}(x)$ are inverses because $f(f^{-1}(x))=x$ and $f^{-1}(f(x))=x$

① Find the inverse function. ② Verify your answer. ③ Determine the domain and range of each:

$$f(x)=\frac{2x+3}{x+2}$$ 1-1 ✓

③ D: $\{x \mid x \neq -2\}$

R: $\{y \mid y \neq 2\}$

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

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

$xy+2x=2y+3$

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

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

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

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

D: $\{x \mid x \neq 2\}$

R: $\{y \mid y \neq -2\}$

② $f(f^{-1}(x))=\dfrac{2\left(\frac{-2x+3}{x-2}\right)+3}{\frac{-2x+3}{x-2}+2}$

$=\dfrac{\frac{-4x+6}{x-2}+\frac{3x-6}{x-2}}{\frac{-2x+3}{x-2}+\frac{2x-4}{x-2}}$

$=\dfrac{\frac{-x}{x-2}}{\frac{-1}{x-2}}=\frac{-x}{x-2}\cdot\frac{x-2}{-1}$

$f(f^{-1}(x))=x$ ✓

$f^{-1}(f(x))=\dfrac{-2\left(\frac{2x+3}{x+2}\right)+3}{\frac{2x+3}{x+2}-2}$

$=\dfrac{\frac{-4x-6}{x+2}+\frac{3x+6}{x+2}}{\frac{2x+3}{x+2}+\frac{-2x-4}{x+2}}=\dfrac{\frac{-x}{x+2}}{\frac{-1}{x+2}}$

$=\frac{-x}{x+2}\cdot\frac{x+2}{-1}$

$f^{-1}(f(x))=x$ ✓

∴ $f(x)$ and $f^{-1}(x)$ are inverses because $f(f^{-1}(x))=x$ and $f^{-1}(f(x))=x$.

Assignment:

p.295 #4-52 (by 4)

* Be sure to write the original problem or sketch the given graph. Show ALL work!! *