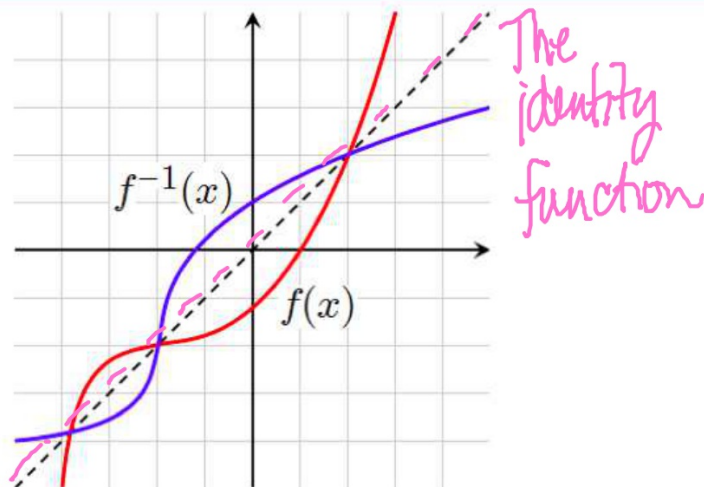


The Inverse Reflection Principle:

use to graphically “confirm” that functions are inverses

The points (a,b) and (b,a) in the coordinate plane are symmetric with respect to the line $y=x$. The points (a,b) and (b,a) are reflections of each other across the line $y=x$.



The Inverse Composition Rule:

Use to algebraically prove that functions are inverses of each other.

A function f is one-to-one with inverse function g if and only if

$f(g(x)) = x$ for every x in the domain of g , and

$g(f(x)) = x$ for every x in the domain of f .

composition

Example Verifying Inverse Functions

Show algebraically the $f(x) = x^3 + 2$ and $g(x) = \sqrt[3]{x-2}$ are inverse functions.

$$f(g(x))$$

$$f(\sqrt[3]{x-2})$$

$$(\sqrt[3]{x-2})^3 + 2$$

$$x-2+2$$

$$x \checkmark \text{ Since } f(g(x)) = x$$

and $g(f(x)) = x$, f and g are inverses.

$$g(f(x))$$

$$g(x^3+2)$$

$$\sqrt[3]{x^3+2-2}$$

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

$$x \checkmark$$

AM: Find inverses of relations

2. Find the inverse of the relation $y = 2x + 4$.

[A] $y = \frac{2x-4}{2}$

[B] $y = \frac{x+4}{2}$

[C] $y = 4x+2$

☒ [D] $y = \frac{x-4}{2}$

① one-to-one ✓

② Switch x & y

$$x = 2y + 4$$

③ Solve for y

$$x - 4 = 2y$$

$$\frac{x-4}{2} = \frac{2y}{2}$$

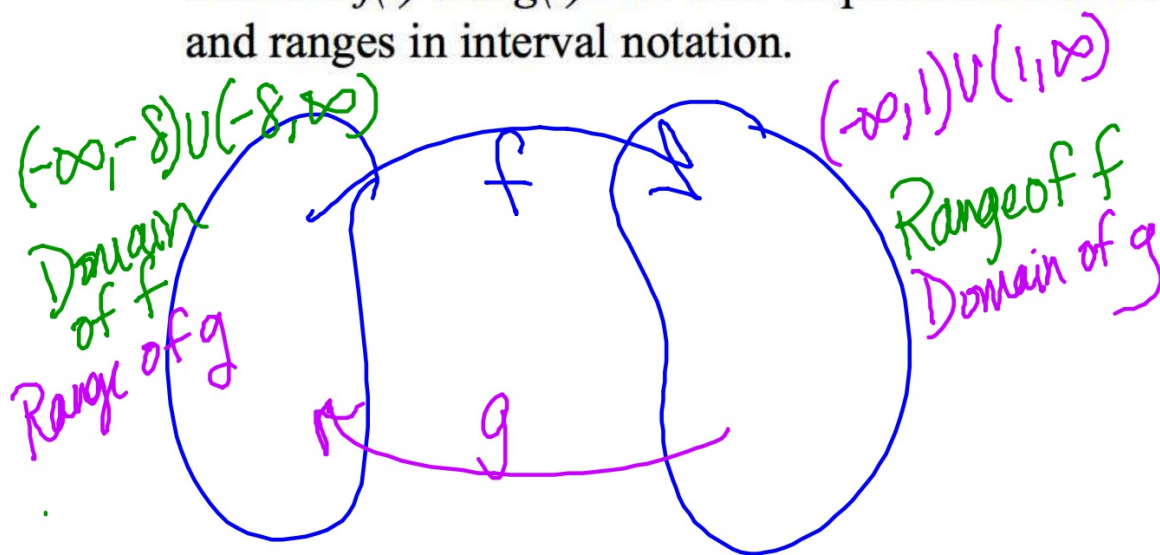
$$\frac{x-4}{2} = y$$

Quiz #3 Practice

$2x-3=0$
 $+3+3$
 $2x=3$
 $x=3/2$

■ Let $f(x) = \frac{(x-7)}{(x+8)}$ and $g(x) = \frac{-8x-7}{x-1}$, the functions $f(t)$ and $g(t)$ are inverses.

a) Draw a function map that reveals the relationships between $f(t)$ and $g(t)$ and their respective domains and ranges in interval notation.



Quiz Practice #3

b. Confirm algebraically that f and g are inverses by showing that $f(g(x)) = x$ and $g(f(x)) = x$.

$$f(x) = \frac{x-7}{x+8}$$

$$g(x) = \frac{-8x-7}{x-1}$$

■ Left side $f(g(x))$

The handwritten work shows the calculation of $f(g(x))$. On the left, $f\left(\frac{-8x-7}{x-1}\right)$ is written in purple. An equals sign follows. To the right of the equals sign, there are two stacked fractions. The top fraction has a numerator box containing $\frac{-8x-7}{x-1}$ (purple) and a denominator of -7 (green). The bottom fraction has a numerator box containing $\frac{-8x-7}{x-1}$ (purple) and a denominator of $+8$ (green). To the right of these fractions is a large pink box containing $\frac{(x-1)}{1}$ over $\frac{(x-1)}{1}$. Red arrows indicate the substitution of $g(x)$ into $f(x)$: one arrow points from the top numerator box to the top numerator of f , and another points from the bottom numerator box to the bottom numerator of f . A third red arrow points from the top denominator -7 to the top denominator of f . A fourth red arrow points from the bottom denominator $+8$ to the bottom denominator of f . A pink double-slash symbol is placed between the two main fractions.

$$f\left(\frac{-8x-7}{x-1}\right) = \frac{\left(\frac{-8x-7}{x-1} - 7\right) \cdot \frac{(x-1)}{1}}{\left(\frac{-8x-7}{x-1} + 8\right) \cdot \frac{(x-1)}{1}}$$

$$\begin{array}{rcl}
 \frac{-8x-7}{x-1} \cdot \frac{(x-1)}{1} - \frac{7(x-1)}{1} & & \\
 \hline
 \frac{-8x-7}{x-1} \cdot \frac{(x-1)}{1} + \frac{8(x-1)}{1} & = & \frac{-8x-7-7x+7}{-8x-7+8x-8} \\
 & & = \frac{-15x}{-15} = \boxed{X}
 \end{array}$$

■ Right side $f(g(x))$

$$g(x) = \frac{-8x-7}{x-1}$$

$$g\left(\frac{x-7}{x+8}\right) = \left(-8 \frac{x-7}{x+8} - 7\right) \frac{x+8}{1} = \frac{-8(x-7) - 7(x+8)}{1} = \frac{-8x + 56 - 7x - 56}{1} = \frac{-15x}{1} = -15x$$

$$\frac{-8x + 56 - 7x - 56}{x-7-x-8} = \frac{-15x}{-15} = x$$

Since $f(g(x)) = x$ and $g(f(x)) = x$, we have proven $f(x)$ and $g(x)$ are inverses.

1st 6 weeks (Alba) - Practice Test. 30%

2nd 6 Weeks - 15 objectives Unit Test. 30% ←
5 LCD

3rd 6 Weeks - 19 objectives Unit Test Thurs 30% ←

Final 5 CR. 20 MC.

10%
+ 10%