2.5 Inverses of Functions

Obj: 1. Find the inverse of a fnc or a relation.

2. Verify inverses using composition of fncs.

Inverse: a relation has ordered pairs (x, y) → for the inverse of the relation, we use ordered pairs (y, x).

Switch domain & range.

Oct 23-9:08 AM

Find the inverse:
State if the original is a function.
State if the inverse is a function.

$\{(1,2)\ (2,4)\ (3,6)\ (4,8)\}$

Fnc.

Inv: $\{(2,1)\ (4,2)\ (6,3)\ (8,4)\}$

Fnc.

$\{(1,5)\ (1,6)\ (3,6)\ (4,9)\}$

Not a fnc

Inv: $\{(5,1)\ (6,1)\ (6,3)\ (9,4)\}$

Not a fnc.

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Finding an Inverse Algebraically:

$g(x) = 3x - 2$

1. Switch x & y

$x = 3y - 2$

$+2 \quad +2$

2. Solve for y

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

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

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

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Find the inverse:

$h(x) = 4x - 5$

$x = 4y - 5$

$+5 \quad +5$

$\frac{x+5}{4} = \frac{4y}{4}$

$y = \frac{1}{4}x + \frac{5}{4}$

$h^{-1}(x) = \frac{1}{4}x + \frac{5}{4}$

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Find the inverse:

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

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

$$5x = 2y + 3$$

$$-3 \quad -3$$

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

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

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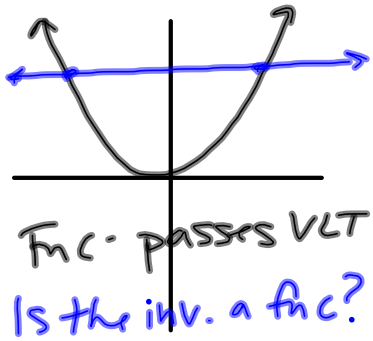
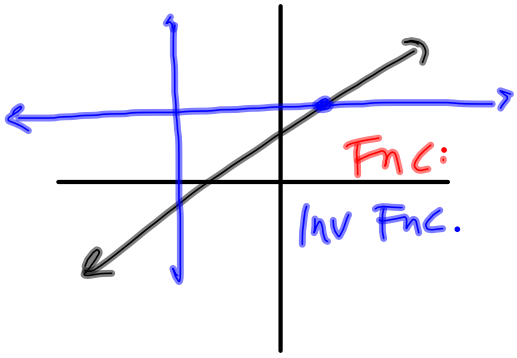


Fnc. passes VLT

Is the inv. a fnc?
(pass the HLT)
NO - the inv. is not a fnc.



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Compositions & Inverses

$f(x)$ & $g(x)$ are fncs.

If $f \circ g = g \circ f = x$ then

$f(x)$ and $g(x)$ are inverses of each other.

Verify, prove

Use composition of fncs to show that $f(x) = 7x - 2$ and $g(x) = \frac{1}{7}x + \frac{2}{7}$ are inverses.

$f \circ g$, $g \circ f = x$

$f \circ g = 7\left(\frac{1}{7}x + \frac{2}{7}\right) - 2$

$= x + 2 - 2$

$= x$

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

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

$= x$

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Using composition of functions, show $f(x) = -5x + 7$ and $g(x) = -\frac{1}{5}x + \frac{7}{5}$ are inverses.

$f \circ g = -5\left(-\frac{1}{5}x + \frac{7}{5}\right) + 7$

$= x - 7 + 7$

$= x$

$g \circ f = -\frac{1}{5}(-5x + 7) + \frac{7}{5}$

$= x - \frac{7}{5} + \frac{7}{5}$

$= x$

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