SM 3H

Date: 12/5/23 **Section:** 4.5

Objective: I can find the inverse of a function.

Vocabulary:

Inverse: opposite

Inverse operation: operation that undo each other

Inverse property: opp. property

One-to-one property: Both f(x) & $f^{-1}(x)$ are functions

Way to find one-to-one: Pass VLT & HLT

To find the inverse using a table: flip-flop x & y **To find the inverse using ordered pairs:**

Example 1:

$f(x)$	
x	y
5	5
7.5	6
-9	-8
15	-5
-2	3

inverse notation

$f^{-1}(x)$	
x	y
5	5
6	7.5
-8	-9
-5	15
3	-2

Example 2:

$\{(1,1),(2,4),(3,9),(0,0),(-1,1),(-2,4)\}$

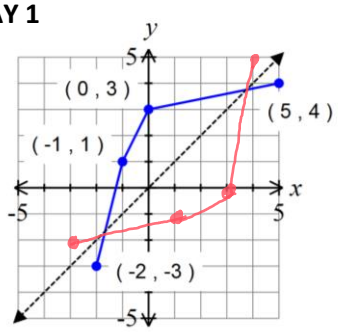
$\{(1,1),(4,2),(9,3),(0,0),(1,-1),(4,-2)\}$

To find the inverse using a graph: WAY 1) find some ordered & flip-flop them

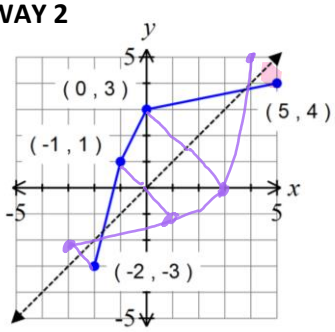
WAY 2) reflecting over y=x

Example 3:

WAY 1



WAY 2



Which of the above examples, #1, #2, or #3, are one-to-one and why? 1 & 3

Which parent graph is not one-to-one without restrictions?

To find the inverse using an equation: ① flip-flop x & y
② solve y

Find the inverse function, domain, and range.

Example 1: $f(x)=y$

$f(x)=-3x+1$ $(-\infty,\infty)=D=x$ becomes R & inverse

$x=-3y+1$

$x-1=-3y$

$\frac{x-1}{-3}=f^{-1}(x)$ $D=(-\infty,\infty)$ $R=(-\infty,\infty)$

Example 2:

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

$3-x\geq 0$
$-x\geq -3$
$x\leq 3$
$D=(-\infty,3]=x$

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

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

$\frac{x^2}{4}=3-y$

$\frac{x^2}{4}-3=-y$

$f^{-1}(x)=-\frac{x^2}{4}+3$
$D=(-\infty,\infty)$
$R=(-\infty,3]=y$

Example 3:

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

Example 4:

$f(x)=\frac{2x+3}{5x-4}$

$x=\frac{2y+3}{5y-4}$

$5xy-4x=2y+3$

$5xy-2y=4x+3$

$y(5x-2)=4x+3$

$D=(-\infty,\frac{4}{5})\cup(\frac{4}{5},\infty)$

$f^{-1}(x)=\frac{4x+3}{5x-2}$
$D=(-\infty,\frac{2}{5})\cup(\frac{2}{5},\infty)$
$R=(-\infty,\frac{4}{5})\cup(\frac{4}{5},\infty)$

Prove / show All work

To verify that two functions are inverses, show that $(f\circ g)(x)=(g\circ f)(x)=x$.

Example 1:

Verify that the inverse of $f(x)=\frac{2}{x+5}$ is $f^{-1}(x)=\frac{2}{x}-5$.

Example 2:

Verify that the inverse of $f(x)=\sqrt[3]{2x}$ is $f^{-1}(x)=\frac{x^3}{2}$.

$(f\circ g)(x)$

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

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

x

$(g\circ f)(x)$

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

$\frac{2x}{2}$

x

they are inverses