Sec. 1.4: Inverse of a Relation

Inverse of a function: if f is a function with domain A and range B, the inverse will have a domain B and range A.

The inverse will be denoted f^{-1}.

Basically, the x and y-values switch.

$$(x,y) \rightarrow (y,x)$$

example:

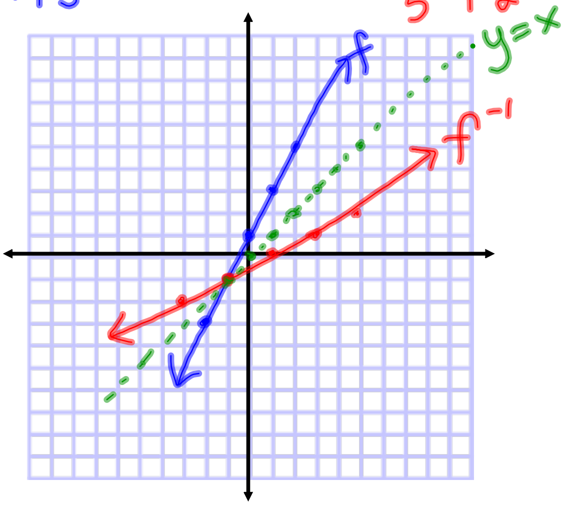
$f = 2x+1$

x	y
-2	-3
-1	-1
0	1
1	3
2	5

$\Rightarrow$

f^{-1}

x	y
-3	-2
-1	-1
1	0
3	1
5	2

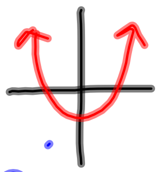


Inverse functions are reflected along the line $y=x$.

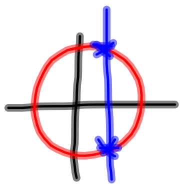
Coordinate points $(-2,-2), (-1,-1), (0,0), (1,1)\ldots$ will be the same points.

Recall: Vertical Line Test

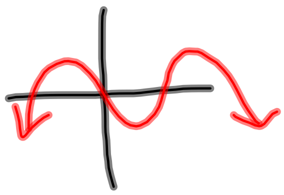
A test used to determine if a given graph is a function.



function

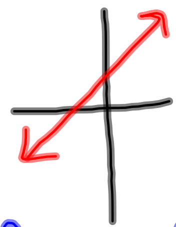


Not a function

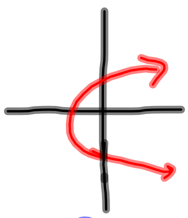


function

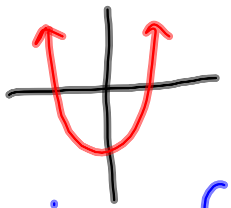
For Inverses, we consider The Horizontal Line Test.



f is a function AND f^{-1} is a function



f is not a function But f^{-1} is a function



f is a function But f^{-1} is not a function

Restricting the Domain on functions to make sure the Inverse will be a function.

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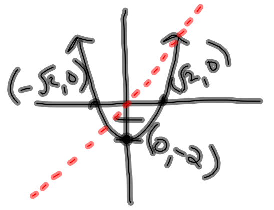
$f(x) = x^2 - 2$



$x^2 - 2 = 0$

$x^2 = 2$

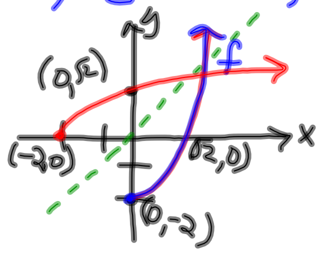
$x = \pm\sqrt{2}$

$f(x)$ is a function

$f^{-1}(x)$ is not

If we restricted the domain (cut the parabola in half), the inverse will be a function.

For ex.) $\{x \mid x \geq 0, x \in R\}$



$f(x)$

D: $\{x \mid x \geq 0, x \in R\}$

R: $\{y \mid y \geq -2, y \in R\}$

$f^{-1}(x)$

D: $\{x \mid x \geq -2, x \in R\}$

R: $\{y \mid y \geq 0, y \in R\}$

$f(x) = x^2 - 2$

$y = x^2 - 2$ switch x & y

$x = y^2 - 2$ solve for y

$x + 2 = y^2$

$\pm\sqrt{x+2} = y$

one side $\Rightarrow$ $y = \sqrt{x+2}$

practice pg. 51

\# 2a, 3, 4