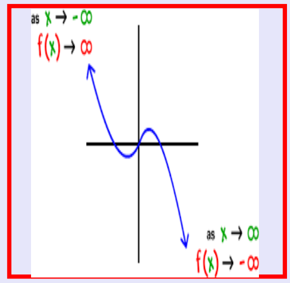
Math 245

Spring 2022

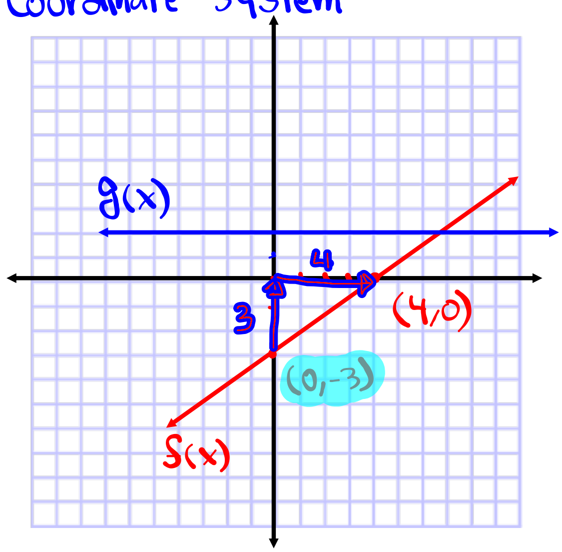
Lecture 20

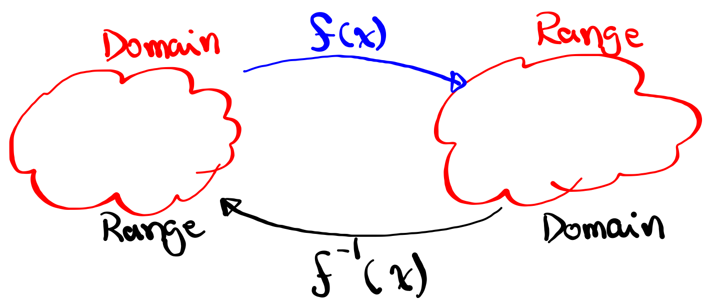


Class QZ 7

Graph in the same coordinate system

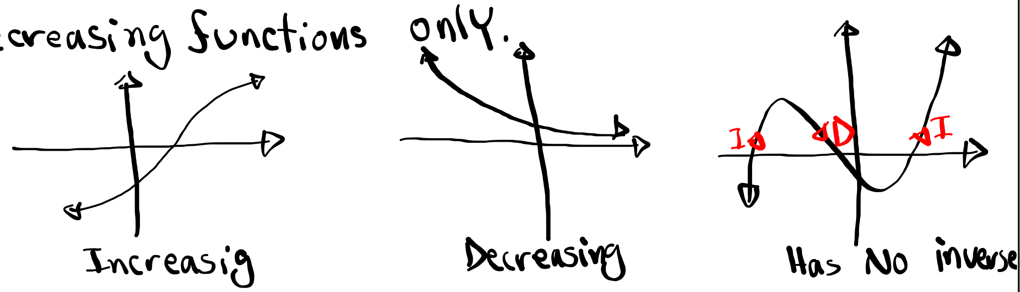
$$\begin{cases} f(x) = \frac{3}{4}x - 3 \\ g(x) = 2 \end{cases}$$





"f inverse of x"

this only works for increasing functions OR decreasing functions only.



How to find $f^{-1}(x)$:

1) Replace $f(x)$ with y.
2) Switch x & y.
3) Solve for y.
4) Replace y with $f^{-1}(x)$.

$f(x) = 2x + 6$

$y = 2x + 6$

$x = 2y + 6$

$x - 6 = 2y$

$\frac{x-6}{2} = y$

$\boxed{f^{-1}(x) = \frac{x-6}{2}}$

$f(x) = 2x + 6$

$f(1) = 2(1) + 6 = 8$

$1 \longrightarrow 8$

$f^{-1}(8) = \frac{8-6}{2} = \frac{2}{2} = 1$

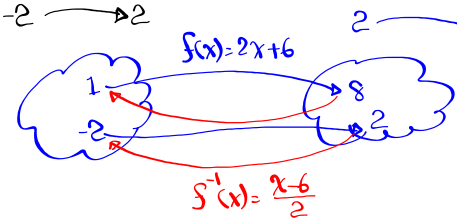
$8 \longrightarrow 1$

$f(-2) = 2(-2) + 6 = 2$

$-2 \longrightarrow 2$

$f^{-1}(2) = \frac{2-6}{2} = \frac{-4}{2} = -2$

$2 \longrightarrow -2$



March 15, 2022

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

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

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

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

$2x=3y-2$

$2x+2=3y$

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

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

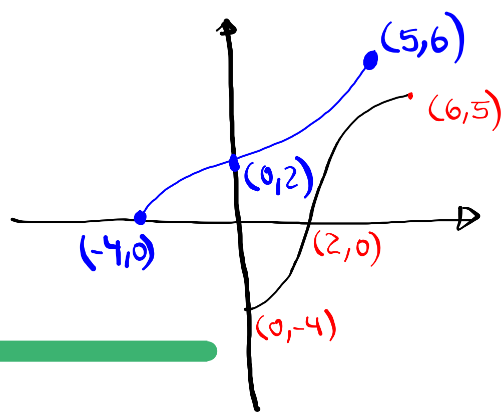
$f(0)=\frac{3}{2}(0)-1=0-1=-1 \Rightarrow (0,-1)$

$f^{-1}(-1)=\frac{2(-1)+2}{3}=\frac{-2+2}{3}=\frac{0}{3}=0 \Rightarrow (-1,0)$

$f(4)=\frac{3}{\cancel{2}}(\cancel{4}^{2})-1=3(2)-1=6-1=5 \Rightarrow (4,5)$

$f^{-1}(5)=\frac{2(5)+2}{3}=\frac{10+2}{3}=\frac{12}{3}=4 \Rightarrow (5,4)$

When a function passes the Horizontal Line Test, then it has an iverse.



1) Function by V.L.T.

2) It has an inverse by H.L.T.

3) Domain $[0,6]$
Range $[-4,5]$

4) Draw the inverse

5) For the inverse:
Domain $[-4,5]$
Range $[0,6]$

$f(x) = \sqrt{x-3}$ Find $f^{-1}(x)$

$y = \sqrt{x-3}$

$x = \sqrt{y-3}$

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

$x^2 = y - 3$

$x^2 + 3 = y$

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

$f(3) = \sqrt{3-3} = 0$

$f^{-1}(0) = 0^2 + 3 = 3$

$f(7) = \sqrt{7-3} = \sqrt{4} = 2$

$f^{-1}(2) = 2^2 + 3 = 4 + 3 = 7$

	Domain	Range
$f(x)$	$[3, \infty)$	$[0, \infty)$
$f^{-1}(x)$	$[0, \infty)$	$[3, \infty)$

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

$x - 3 \geq 0$ $x \geq 3$

	Domain	Range
$f(x)$	$x \geq 3$	$y \geq 0$
$f^{-1}(x)$	$x \geq 0$	$y \geq 3$

$f(x)$ and $g(x)$ are inverse of each other when $(f \circ g)(x) = x$ AND $(g \circ f)(x) = x$.

$f(x) = 2x - 5$ and $g(x) = \frac{x+5}{2}$

Show that $f(x)$ and $g(x)$ are inverse of each other.

$(f \circ g)(x) = f(g(x)) = 2[g(x)] - 5 = \cancel{2} \cdot \frac{x+5}{\cancel{2}} - 5$

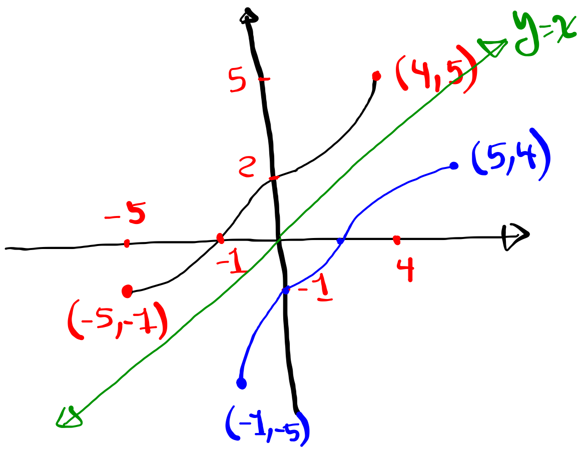
$= x \cancel{+5} \cancel{-5} = \boxed{x}$

$(g \circ f)(x) = g(f(x)) = \frac{f(x) + 5}{2} = \frac{2x \cancel{-5} \cancel{+5}}{2}$

$= \frac{\cancel{2}x}{\cancel{2}} = \boxed{x}$

Since $(f \circ g)(x) = x$ and $(g \circ f)(x) = x$, then $f(x)$ and $g(x)$ are inverse of each other.

Draw the inverse of the graph below:



Class QZ 8

Given $f(x) = 3x - 8$, find its inverse.

$y = 3x - 8$

$x = 3y - 8 \qquad x + 8 = 3y \qquad y = \dfrac{x+8}{3}$

$$\boxed{f^{-1}(x) = \frac{x+8}{3}}$$