Day 80

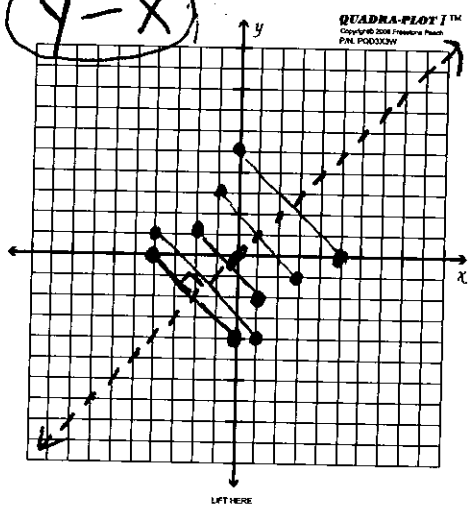
7.7 Inverse Relations and Functions

The inverse of a relation switches the x-values (domain) and the y-values (range).

inverse notation: $f^{-1}(x)$ y^{-1}

ex1 The inverse of $\{(3,-1),(1,-4),(0,5),(-2,1),(-4,0)\}$ is $\{(-1,3),(-4,1),(5,0),(1,-2),(0,-4)\}$

y=x



$y = mx + b$
$y = 1x + 0$

The line y=x is always the line of reflection for a relation and its inverse.

ex 2 Graph the function and its inverse.

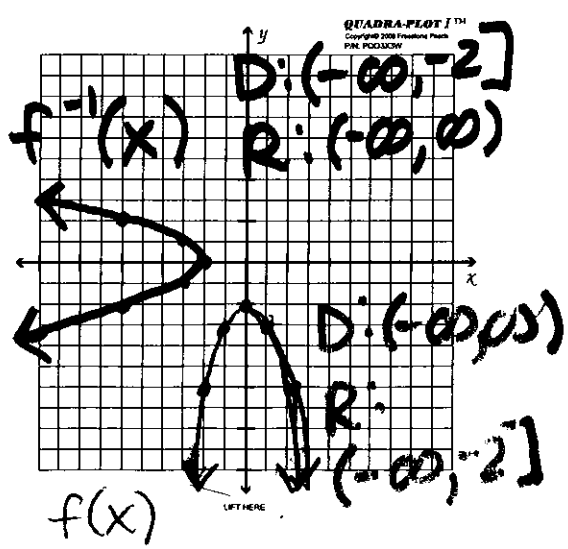
$y = -x^2 - 2$

x	y
-2	-6
-1	-3
0	-2
1	-3
2	-6

Function

$f^{-1}(x)$	
-6	-2
-3	-1
-2	0
-3	1
-6	2

x's repeat inverse is not a function



ex3 Find the inverse of $y = 3x - 2$

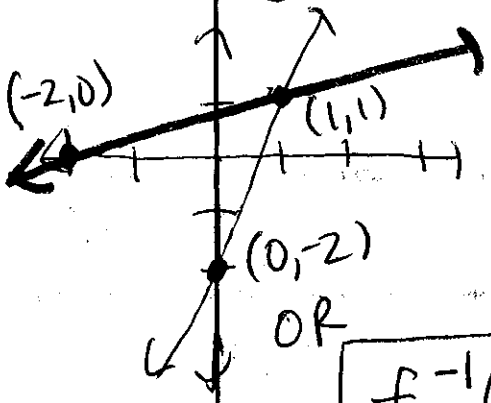
- switch x+y
- Solve for y.

$x = 3y - 2$

$+2 \quad +2$

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

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



OR

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

the slopes of a line and its inverse are always reciprocals.

Domain/Range $(-\infty, \infty)$ diagonal lines

ex4 Find the inverse of $f(x) = x^2 + 3$

$y = x^2 + 3$

switch x+y

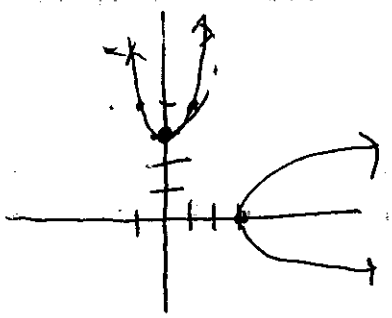
$x = y^2 + 3$

$-3 \quad -3$

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

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

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



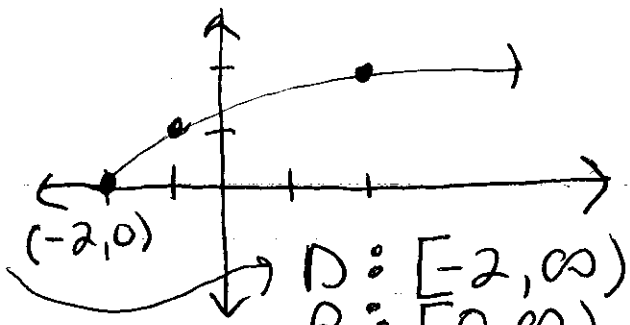
ex 5 Find the inverse of $f(x)=\sqrt{x+2}$. Find the domain + range of both. Decide if any are functions.

$y=\sqrt{x+2}$

$x+2=0$

$-2\ \ -2$

$x=-2$



D: $[-2,\infty)$

R: $[0,\infty)$

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

$x^2=y+2$

$-2\ \ -2$

$y^{-1}=x^2-2$

$f^{-1}(x)$:

D: $[0,\infty)$

R: $[-2,\infty)$

$f^{-1}(x)=x^2-2$, where $x\geq 0$

p. 410 (1-14, 18, 19, 23, 24, 27)

+(x)