

Unit 4 Day 1

Inverse Functions and Relations

- Use old assignment sheet until Tuesday
- HW: Use graph paper for #78, 80, 92 & 96.
- Spend time on #92 & 96!

Nov 14-5:14 PM

4.1 Inverse Functions & Relations

PreCalc
Unit 4 Day 1

Graphically: To find the inverse, interchange x and y values.

*Inverse is a reflection in the line $y = x$

1. $y = x^2 + 2x$

D: $\{x | x \in \mathbb{R}\}$
or $(-\infty, \infty)$

R: $\{y | y \geq -1\}$
or $[-1, \infty)$

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

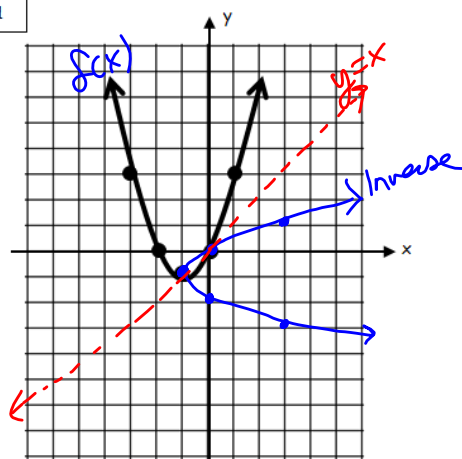
1. inverse relation:

D: $\{x | x \geq -1\}$
or $[-1, \infty)$

R: $\{y | y \in \mathbb{R}\}$
or $(-\infty, \infty)$

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

For #1



Nov 9-11:16 AM

2. $y = \sqrt{x+3} \rightarrow \begin{matrix} x \geq -3 \\ x \geq -3 \end{matrix}$

D: $\{x | x \geq -3\}$
or $[-3, \infty)$

R: $\{y | y \geq 0\}$
or $[0, \infty)$

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

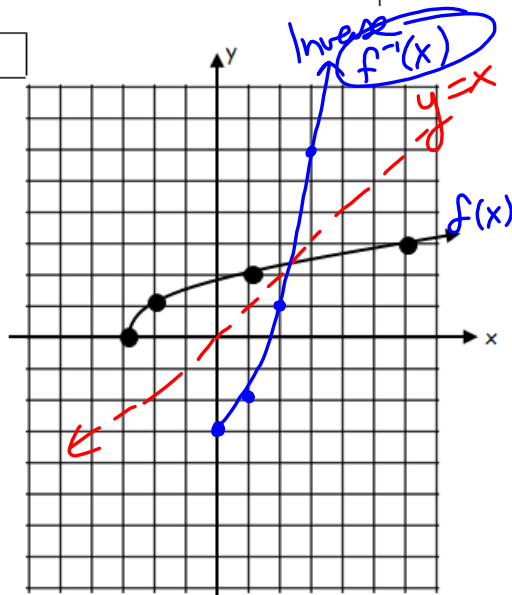
2. inverse relation

D: $\{x | x \geq 0\}$

R: $\{y | y \geq -3\}$

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

For #2



Nov 9-11:23 AM

One-to-one function $\rightarrow$ distinct independent variables produce distinct dependent variables.
If $a \neq b$ then $f(a) \neq f(b)$

One-to-one functions have inverses that are functions.

Which one, #1 or #2, is a one-to-one function?

(x's) (y's)
 $x \leftrightarrow y$
must pass the
vertical &
horizontal
line tests
to be 1 to 1.

Nov 9-11:26 AM

To find an inverse of a one-to-one function algebraically:

1. State domain and range of $f(x)$
2. Replace $f(x)$ with y .
3. Exchange x and y . $\rightarrow$ Inverse
4. Solve for y .
5. Write in function notation $f^{-1}(x)$
6. Exchange domain & range of $f(x)$

To Check on Graphing Calculator:

$$Y_1 = f(x)$$

Go to Home screen (2nd Mode)

2nd PRGM 8: DrawInv

VARS $\rightarrow$ YVARS $\rightarrow$ Function $\rightarrow$ Y_1 - Enter

Find the inverse of each of the following functions algebraically.

1. $f(x) = \frac{1}{3}x + 2$ linear

① D: $\{x | x \in \mathbb{R}\}$
R: $\{y | y \in \mathbb{R}\}$

② $y = \frac{1}{3}x + 2$

③ $x = \frac{1}{3}y + 2$

④ $(x-2) = (\frac{1}{3}y)$

$y = 3x - 6$

⑤ $f^{-1}(x) = 3x - 6$

⑥ f^{-1} D: $\{x | x \in \mathbb{R}\}$
R: $\{y | y \in \mathbb{R}\}$

Dom: $(-\infty, \infty)$

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



② $y = \sqrt{x-2}$

③ $x = \sqrt{y-2}$

④ $x^2 = (\sqrt{y-2})^2$

$x^2 = y - 2$

$y = x^2 + 2$

⑤ $f^{-1}(x) = x^2 + 2$

⑥ D: $\{x | x \geq 0\}$

R: $\{y | y \geq 2\}$

① Dom restrict.

$$x - 2 \geq 0$$

$$x \geq 2$$

D: $\{x | x \geq 2\}$

x	2	3	4
y	0	1	1.4

R: $\{y | y \geq 0\}$

Nov 9-11:27 AM

To find an inverse of a one-to-one function algebraically:

1. State domain and range of $f(x)$
2. Replace $f(x)$ with y .
3. Exchange x and y .
4. Solve for y .
5. Write in function notation, $f^{-1}(x)$
6. Exchange domain & range.

To Check on Graphing Calculator:

$$Y_1 = f(x)$$

Go to Home screen (2nd Mode)

2nd PRGM 8: DrawInv

VARS $\rightarrow$ YVARS $\rightarrow$ Function $\rightarrow$ Y_1 - Enter

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

① Dom restrict.

D: $\{x | x \neq -2\}$

R: $\{y | y \neq 2\}$

② $y = \frac{2x-1}{x+2}$

③ $x = \frac{2y-1}{y+2}$

④ $xy + 2x = 2y - 1$

$xy - 2y = -2x - 1$

$y(x-2) = -2x-1$

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

⑤ $f^{-1}(x) = \frac{-2x-1}{x-2}$

⑥ $f^{-1}(x)$ D: $\{x | x \neq 2\}$
R: $\{y | y \neq -2\}$

4. $f(x) = x^2 - 2x, x \geq 2$

① D: $\{x | x \geq 2\}$

R: $\{y | y \geq 0\}$

② $y = x^2 - 2x$

③ $x = y^2 - 2y$

④ $y^2 - 2y + 1 = x + 1$

$(y-1)^2 = x+1$

$y-1 = \pm \sqrt{x+1}$

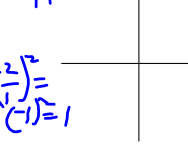
$y = 1 \pm \sqrt{x+1}$

⑤ $f^{-1}(x) = 1 + \sqrt{x+1}$

⑥ D: $\{x | x \geq 0\}$

R: $\{y | y \geq 2\}$

x	2	3	4
y	0	3	8



$x^2 - 2x = 13$

$x^2 - 2x + 1 = 14$

$(x-1)^2 = 14$

$x-1 = \pm \sqrt{14}$

$x = 1 \pm \sqrt{14}$

$x = 1 + \sqrt{14}$

$x = 1 - \sqrt{14}$

⑤ $f^{-1}(x) = 1 + \sqrt{x+1}$

Nov 9-11:28 AM

To find an inverse of a one-to-one function algebraically:

1. State domain and range of $f(x)$
2. Replace $f(x)$ with y .
3. Exchange x and y .
4. Solve for y .
5. Write in function notation, $f^{-1}(x)$
6. Exchange domain & range.

To Check on Graphing Calculator:

$$Y_1 = f(x)$$

Go to Home screen (2nd Mode)

2nd PRGM 8: DrawInv

VARS $\rightarrow$ YVARS $\rightarrow$ Function $\rightarrow$ Y_1 - Enter

$$5. f(x) = \frac{2x+3}{x-1}$$

$$\textcircled{1} D: \{x | x \neq 1\}$$

$$R: \{y | y \neq 2\}$$

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

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

$$\textcircled{4} xy - x = 2y + 3$$

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

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

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

$$VA: x=1$$

$$HA: y=2$$

$$\textcircled{5} f^{-1}(x) = \frac{x+3}{x-2}$$

$$\textcircled{6} D: \{x | x \neq 2\}$$

$$R: \{y | y \neq 1\}$$

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pg 356-358

Find the inverse.

$$4. \{(-1, 3), (2, 5), (-3, 5), (2, 0)\}$$

$$56. f(x) = 7 - x$$

$$59. f(x) = \frac{4}{x+7}$$

$$61. f(x) = \frac{x+4}{x-3}$$

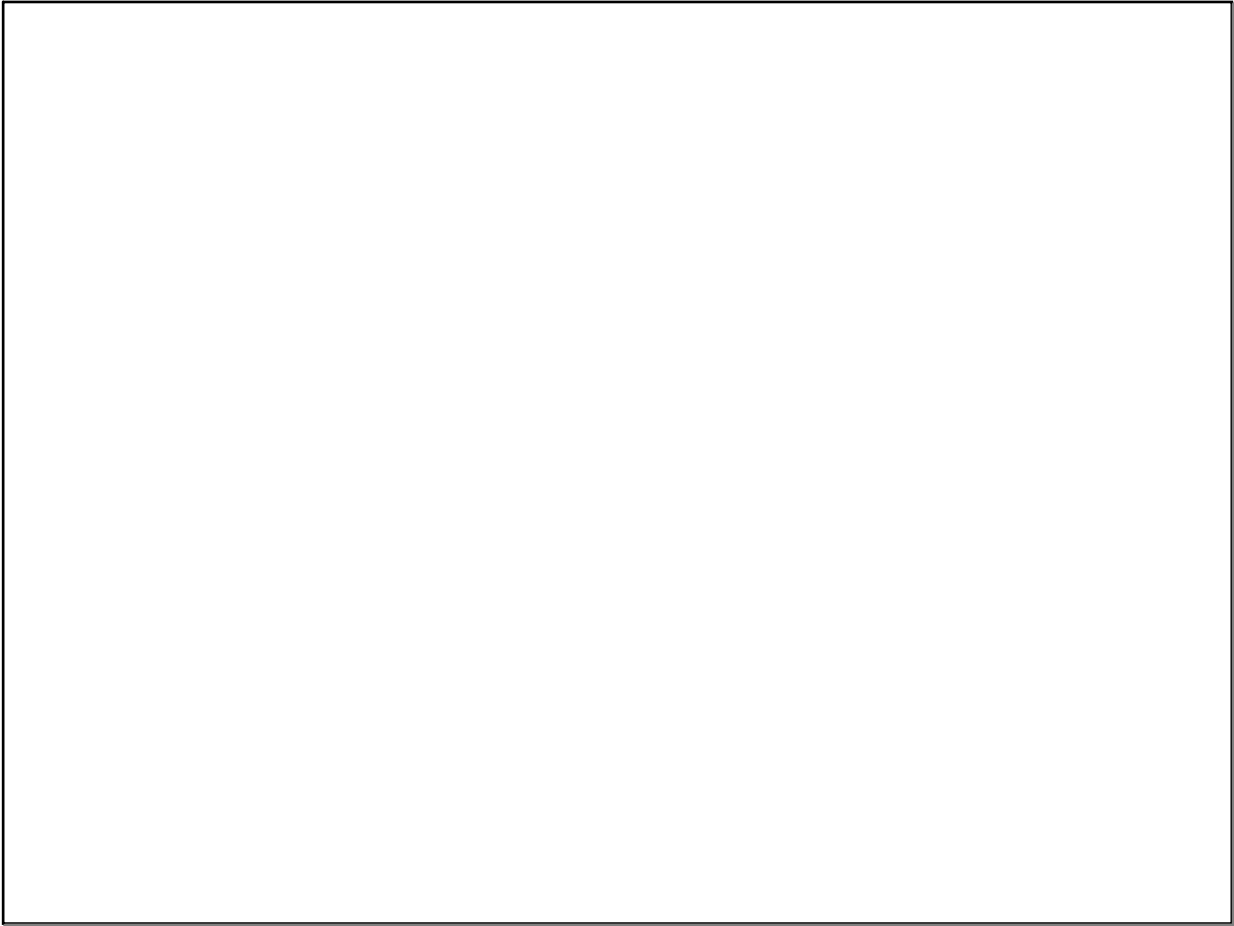
78 & 80:
See Text + book

92 & 96 Graph $f(x)$ & $f^{-1}(x)$
on the same set of axes.
find $f^{-1}(x)$

$$92. f(x) = -\frac{3}{x+1}$$

$$96. f(x) = \frac{x-1}{x+2}$$

Nov 5-2:25 PM



Nov 9-11:29 AM