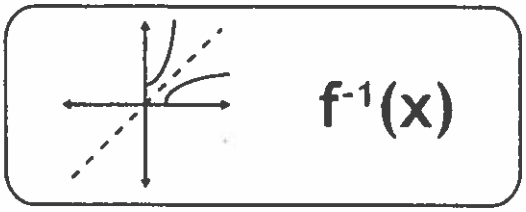
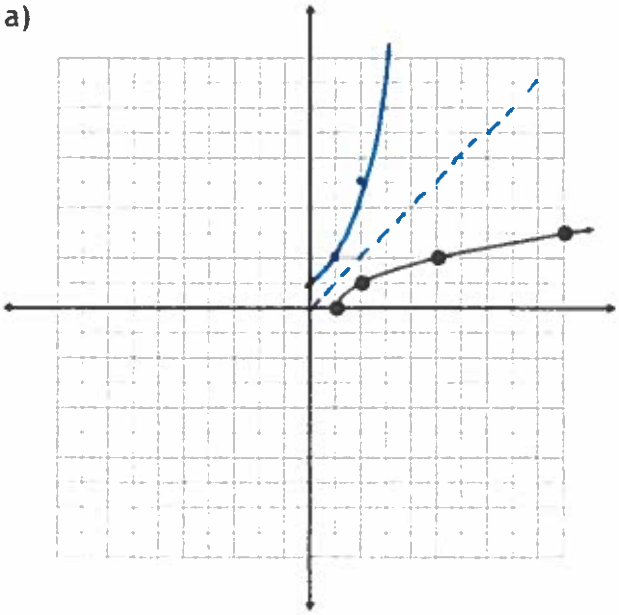
Transformations and Operations
LESSON THREE - *Inverses*
Lesson Notes



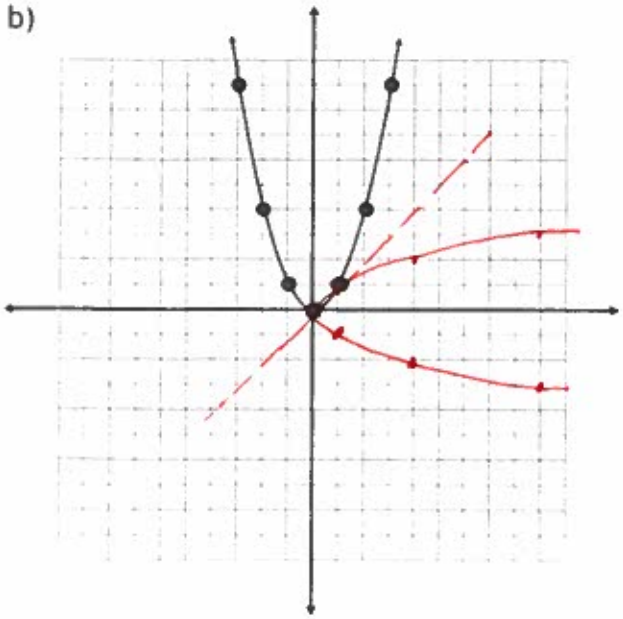
Example 2 For each graph, answer parts (i - iv). Domain and Range

a)

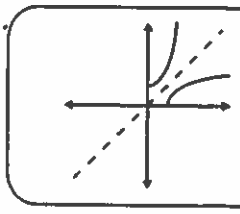


i) Draw the graph of the inverse.
ii) State the domain and range of the original graph.
$\{x \mid x \geq 1, x \in R\}$
$\{y \mid y \geq 0, y \in R\}$
iii) State the domain and range of the inverse graph.
$\{x \mid x \geq 0, x \in R\}$
$\{y \mid y \geq 1, y \in R\}$
iv) Can the inverse be represented with f '(x)?
yes

b)



i) Draw the graph of the inverse.
ii) State the domain and range of the original graph.
$\{x \mid x \in R\}$
$\{y \mid y \geq 0, y \in R\}$
iii) State the domain and range of the inverse graph.
$\{x \mid x \geq 0, x \in R\}$
$\{y \mid y \in R\}$
iv) Can the inverse be represented with f '(x)?
NO



$f^{-1}(x)$

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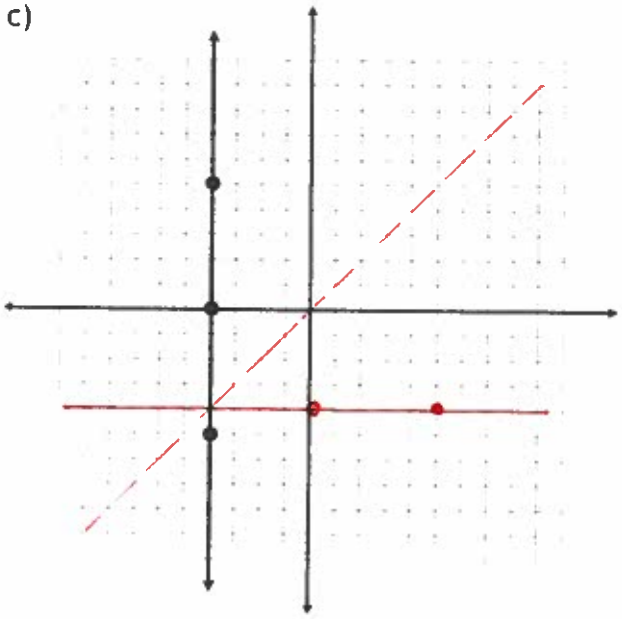
c)



Domain and Range

i) Draw the graph of the inverse.

ii) State the domain and range of the original graph.

$x = -4$

$y \in R$

iii) State the domain and range of the inverse graph.

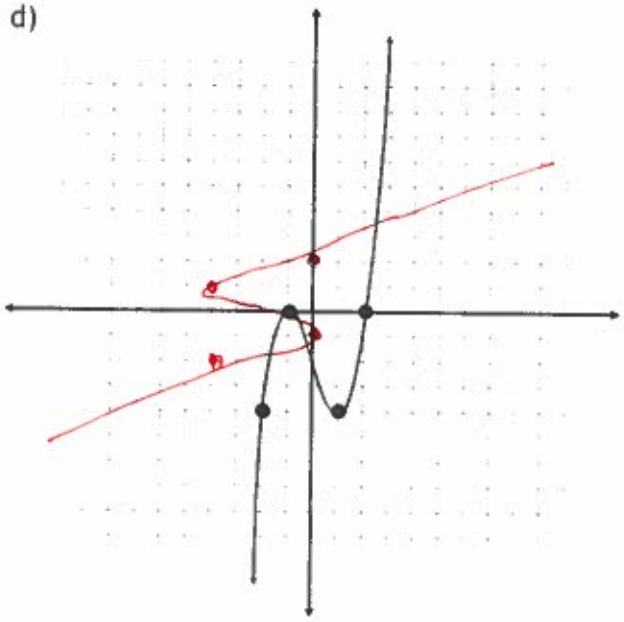
$x \in R$

$y = -4$

iv) Can the inverse be represented with f '(x)?

yes

d)



i) Draw the graph of the inverse.

ii) State the domain and range of the original graph.

$x \in R$

$y \in R$

iii) State the domain and range of the inverse graph.

$x \in R$

$y \in R$

iv) Can the inverse be represented with f '(x)?

NO

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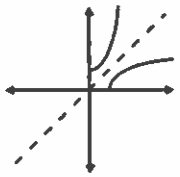


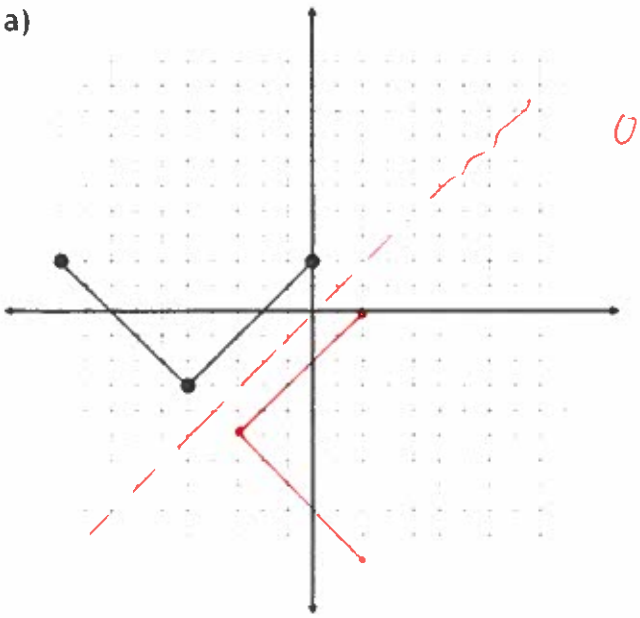
$f^{-1}(x)$

Example 3

For each graph, draw the inverse. How should the domain of the original graph be restricted so the inverse is a function?

Domain restrictions

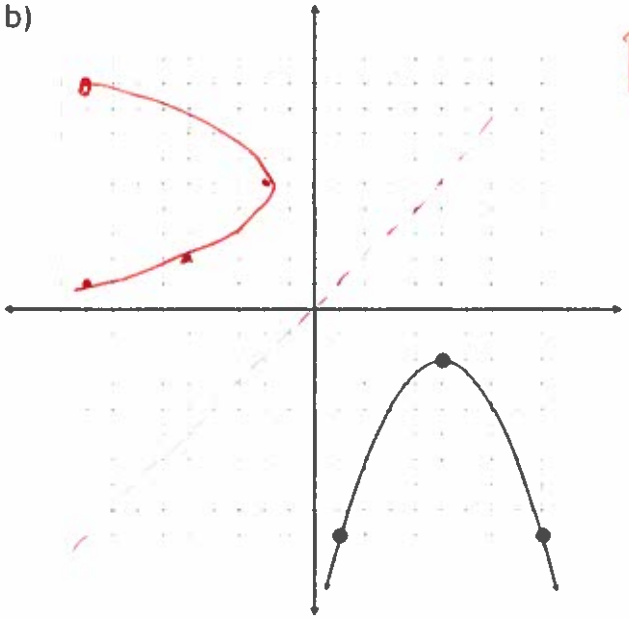
a)



Restricted Domain of original

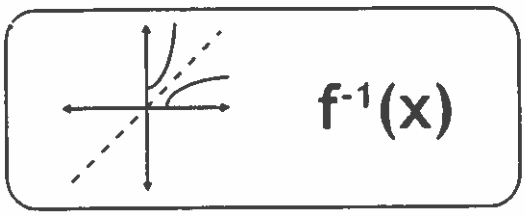
$0 \geq x \geq -5$ or $-10 \leq x \leq -5$

b)



Restricted Domain of original

$x \geq 5$ or $x \leq 5$



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Example 4

Find the inverse of each linear function algebraically. Draw the graph of the original function and the inverse. State the domain and range of both f(x) and its inverse.

Inverses of linear functions

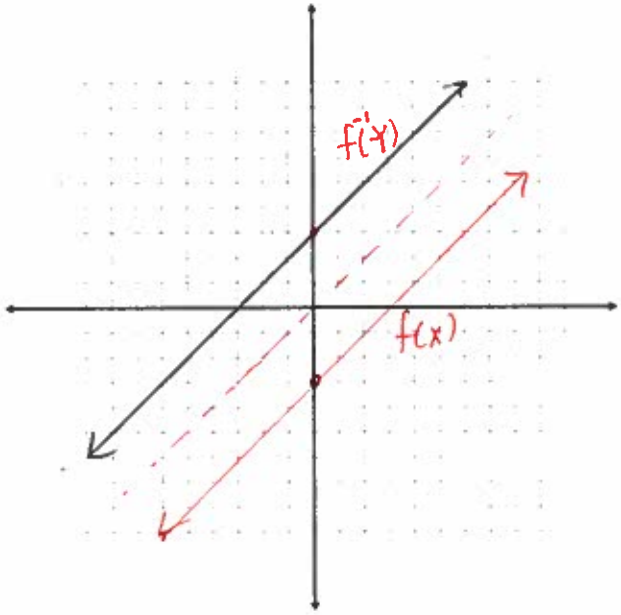
a) $f(x) = x - 3$

$y = x - 3$

$x = y - 3$

$x + 3 = y$

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



Domain $\{x \mid x \in R\}$ Range $\{y \mid y \in R\}$ For Both

b) $f(x) = -\frac{1}{2}x - 4$

$y = -\frac{1}{2}x - 4$

$x = -\frac{1}{2}y - 4$

$x + 4 = -\frac{1}{2}y$

$-2(x+4) = y$

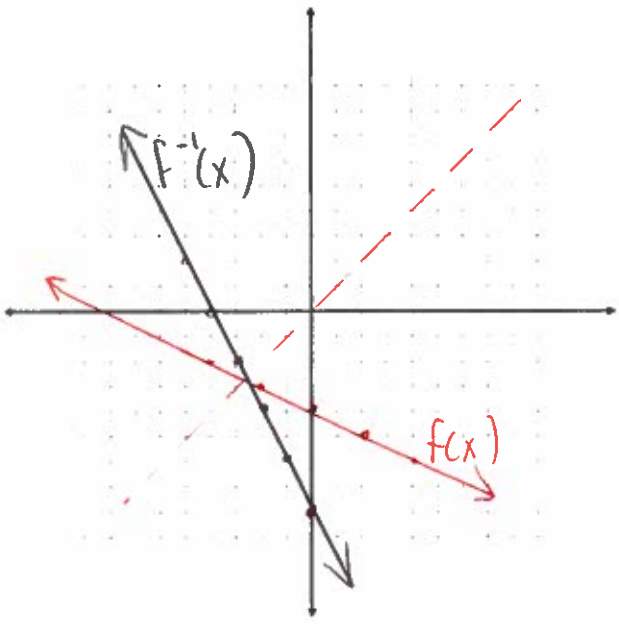
$-2x - 8 = y$

$f^{-1}(x) = -2x - 8$

Domain $x \in R$

Range $x \in R$

for both!



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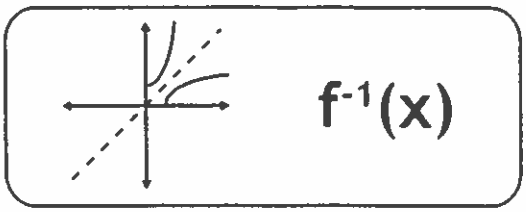


Example 5

Find the inverse of each quadratic function algebraically. Draw the graph of the original function and the inverse. Restrict the domain of f(x) so the inverse is a function.

Inverses of quadratic functions

a) $f(x) = x^2 - 4$

$y = x^2 - 4$

$x = y^2 - 4$

$x + 4 = y^2$

$y = \pm\sqrt{x+4}$

top half

bottom half.

Restriction

vertex : $(0, -4)$

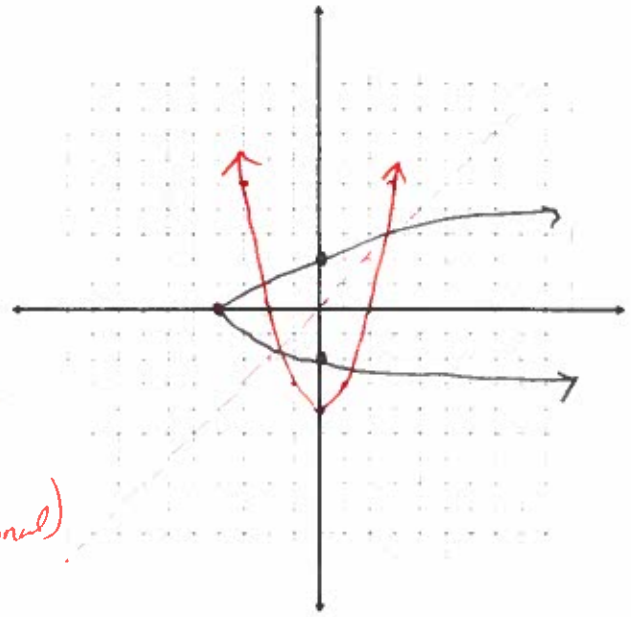
therefore restriction

$x \geq 0$

therefore

$f^{-1}(x) = +\sqrt{x+4}$

Domain? (Range of original)



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

$y = -(x+3)^2 + 1$

inverse

$x = -(y+3)^2 + 1$

$x - 1 = -(y+3)^2$

$-(x-1) = (y+3)^2$

$\pm\sqrt{-(x-1)} = y + 3$

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

Restriction

vertex $(-3, 1)$

$x \geq -3$

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