

Chapter 2(part 2)

Transformations

WORKBOOK

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$$**g(x) = af[k(x - d)] + c**$$

Chapter 2(part 2) Workbook Checklist

Worksheet	Check
Intro to Transformations - Worksheet	
Transformations of x^2 - Worksheet	
Transformations of \sqrt{x} - Worksheet	
Transformations of $\frac{1}{x}$ - Worksheet	
2.7 - Inverse of a Function - Worksheet	
Review	

W1 - Intro to Transformations

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1) Describe the transformations, in order, that are being done to the function $f(x)$.

a) $g(x) = -4f(x)$

b) $g(x) = f(3x)$

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

d) $g(x) = -\frac{1}{3}f\left[\frac{1}{2}(x + 1)\right]$

e) $g(x) = 5f[-2(x - 4)]$

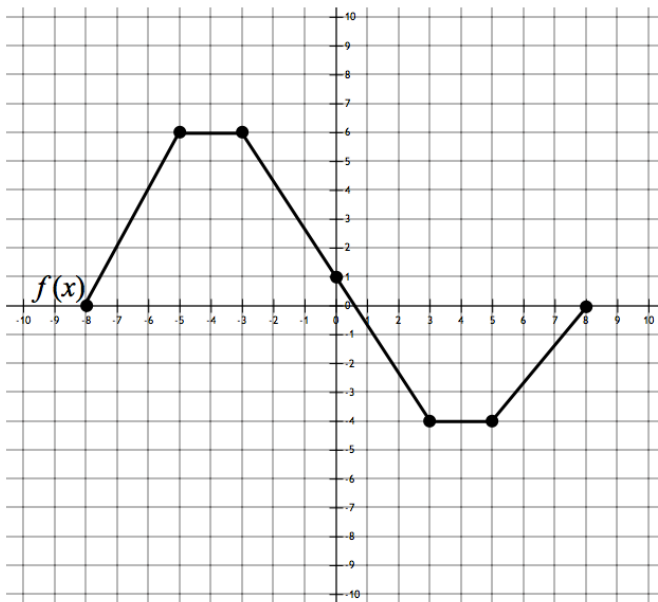
f) $g(x) = -2f(8x) + 4$

h) $g(x) = -\frac{1}{4}f[-3(x - 1)] - 5$

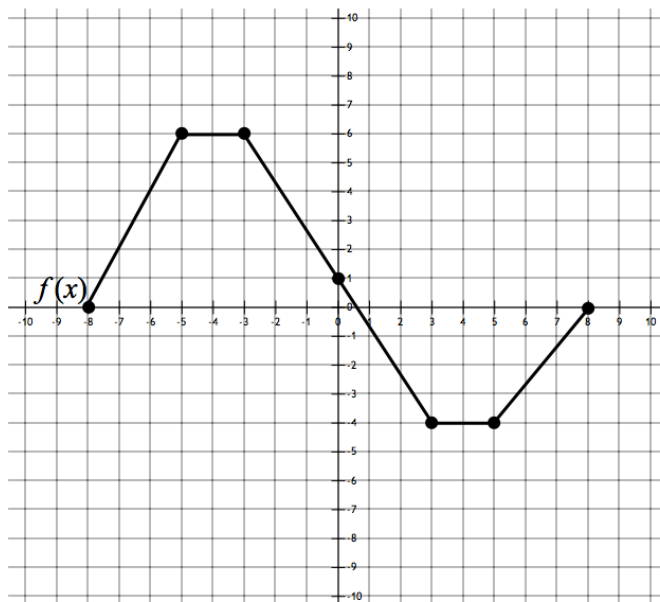
i) $g(x) = 4f\left[-\frac{1}{2}(x + 2)\right] - 1$

2) For the graph of $f(x)$ given, sketch the graph of $g(x)$ after the given transformation.

a) $g(x) = 2f(x) - 2$



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



Answers

1) a) vertical reflection over the x-axis and vertical stretch bafo 4 ($-4y$)

b) horizontal compression bafo $\frac{1}{3}$ ($\frac{x}{3}$)

c) vertical compression bafo $\frac{1}{2}$ ($\frac{y}{2}$), horizontal relection over the y-axis ($-x$)

d) vertical reflection over the x-axis and vertical compression bafo $\frac{1}{3}$ ($\frac{y}{-3}$), horizontal stretch bafo 2 ($2x$), phase shift left 1 unit ($x - 1$)

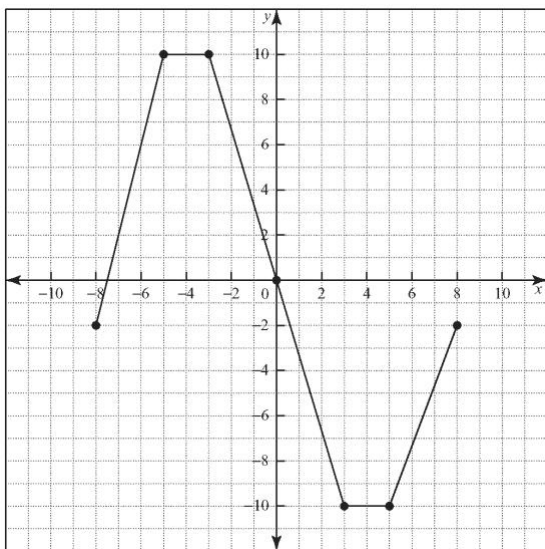
e) vertical stretch bafo 5 ($5y$), horizontal reflection over the y-axis and horizontal compression bafo $\frac{1}{2}$ ($\frac{x}{-2}$), phase shift right 4 units ($x + 4$)

f) vertical reflection over the x-axis and vertical stretch bafo 2 ($-2y$), horizontal compression bafo $\frac{1}{8}$ ($\frac{x}{8}$), shift up 4 units ($y + 4$)

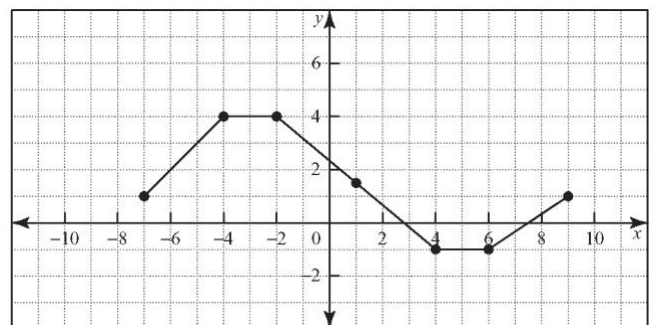
h) vertical reflection over the x-axis and vertical compression bafo $\frac{1}{4}$ ($\frac{y}{-4}$), horizontal reflection over the y-axis and horizontal compression bafo $\frac{1}{3}$ ($\frac{x}{-3}$), phase shift right 1 unit ($x + 1$), shift down 5 units ($y - 5$)

i) vertical stretch bafo 4 ($4y$), horizontal reflection over the y-axis and horizontal stretch bafo 2 ($-2x$), phase shift left 2 units ($x - 2$), shift down 1 unit ($y - 1$)

2) a)



b)



W2 - Transformations of Quadratic Functions

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1) For each of the following graphs:

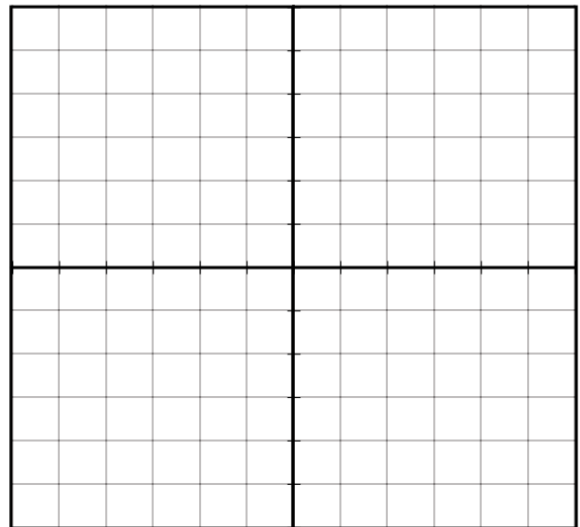
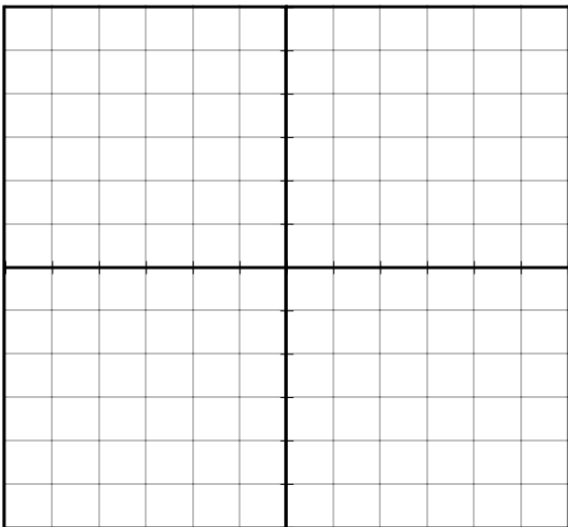
- i) describe the transformations in order ($a \rightarrow k \rightarrow d \rightarrow c$)
- ii) create a table of values for the transformed function
- iii) graph the transformed function

Key points for
 $y = x^2$

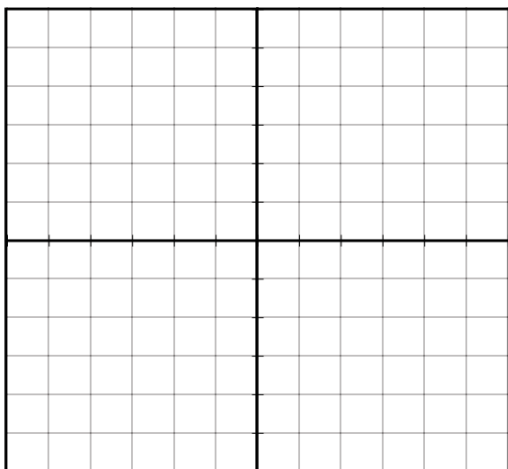
x	y

a) $y = -x^2 + 2$

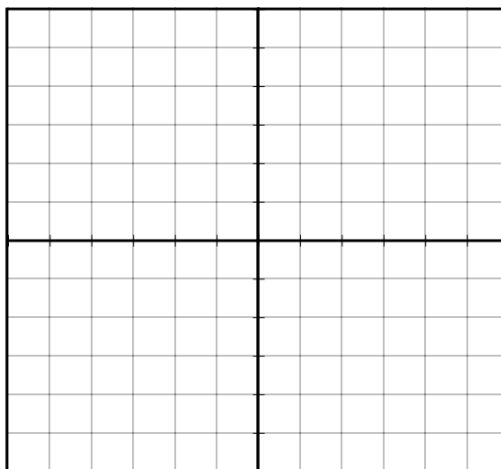
b) $y = (x - 3)^2 + 1$



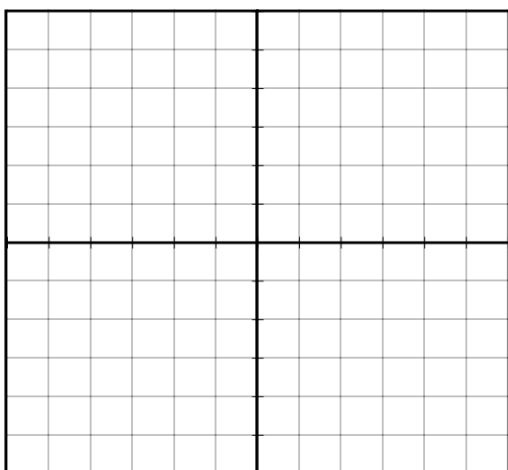
c) $y = 2x^2 - 5$



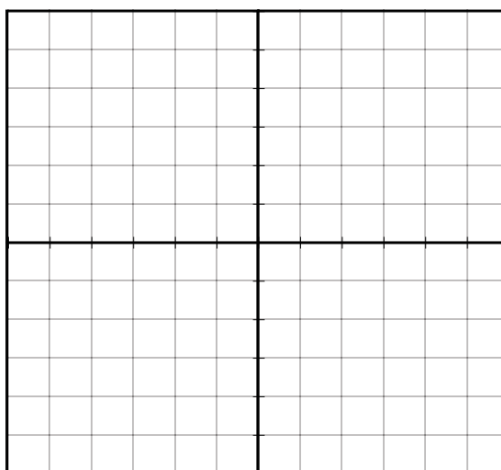
d) $y = -3(x + 1)^2$



e) $y = -(x + 2)^2 + 4$



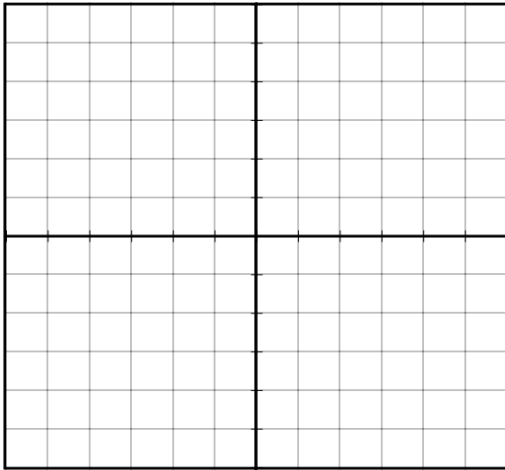
f) $y = -\frac{1}{2}x^2$



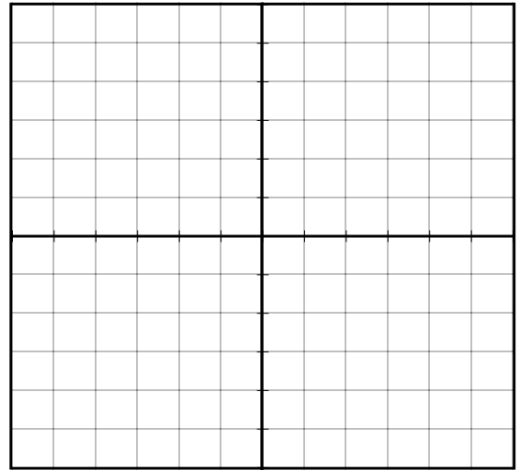
2) For each function $g(x)$:

- i) describe the transformations from the parent function $f(x) = x^2$
- ii) create a table of values of image points for the transformed function
- iii) graph the transformed function and write its equation

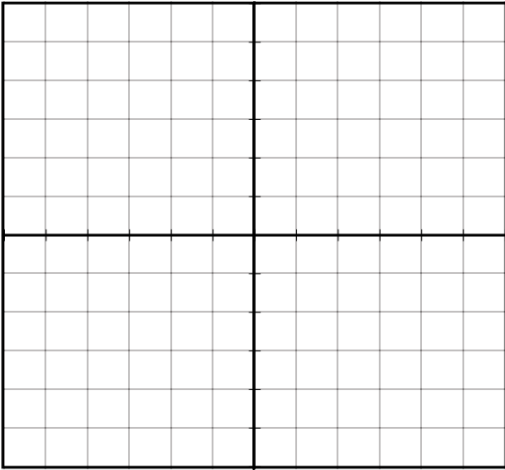
a) $g(x) = -2f\left[\frac{1}{2}(x + 2)\right]$



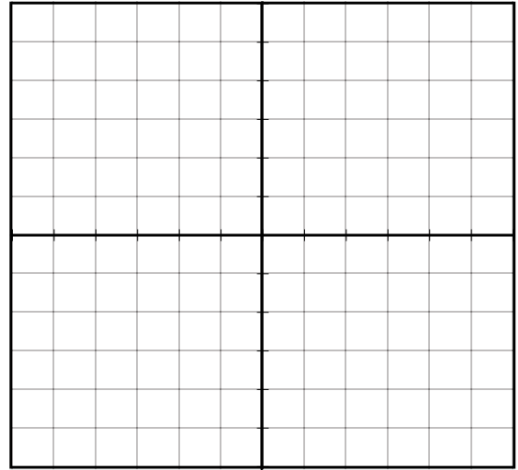
b) $g(x) = 4f(x - 3) - 2$



c) $y = 2f(x + 4) - 3$



d) $y = \frac{1}{2}f[-2(x + 2)] - 3$



W3 - Transformations of \sqrt{x}

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Key points of

$$y = \sqrt{x}$$

x	y

1) 1) State the transformations to the parent function $f(x) = \sqrt{x}$ in the order that you would do them.

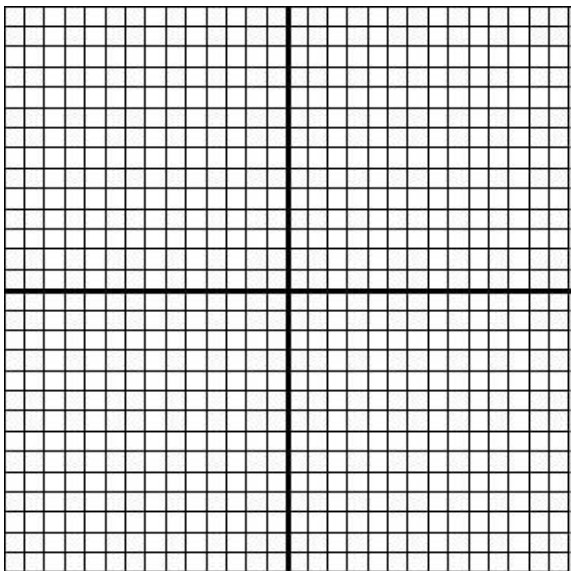
a) $g(x) = 2\sqrt{x+1} - 3$

b) $g(x) = 3\sqrt{\frac{1}{2}(x-5)} + 4$

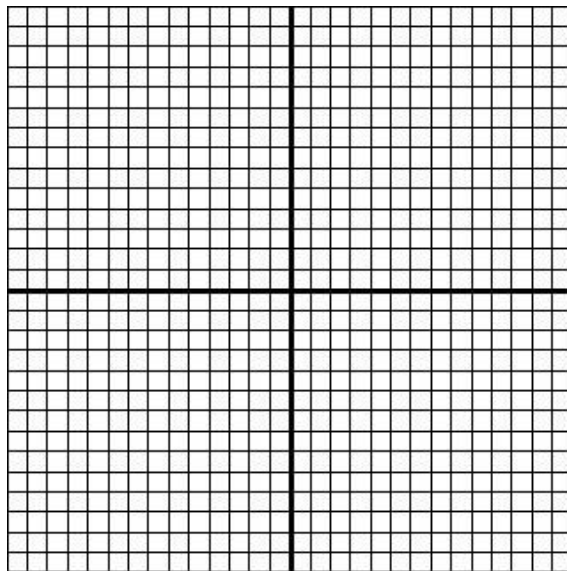
c) $g(x) = -\frac{1}{2}\sqrt{-3(x)} - 6$

2) Graph the parent function, $f(x) = \sqrt{x}$. Describe the transformations in order, make a table of values of image points, write the equation of the transformed function and graph it.

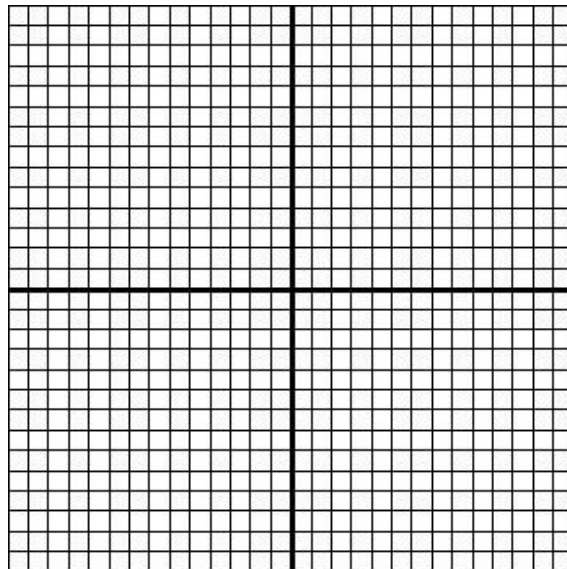
a) $g(x) = f[3(x + 5)]$



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



c) $g(x) = -4f[-2(x - 3)] + 1$



3) Use the description to write the transformed function, $g(x)$.

a) The parent function $f(x) = \sqrt{x}$ is compressed vertically by a factor of $\frac{1}{3}$ and then translated (shifted) 3 units left.

b) The parent function $f(x) = \sqrt{x}$ is reflected over the x-axis, stretch horizontally by a factor of 3 and then translated 1 unit left and 4 units down.

W4 - Transformations of $\frac{1}{x}$

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Key points of

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

x	y

1) State the transformations to the parent function $f(x) = \frac{1}{x}$ in the order that you would do them.

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

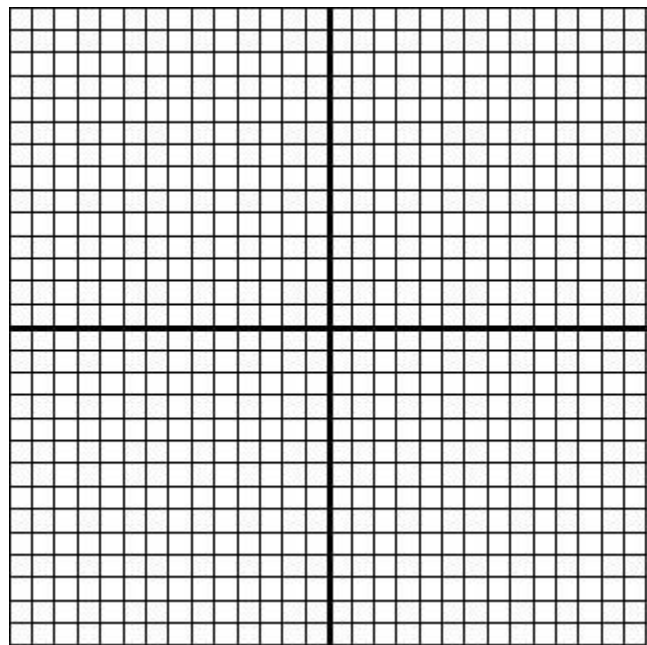
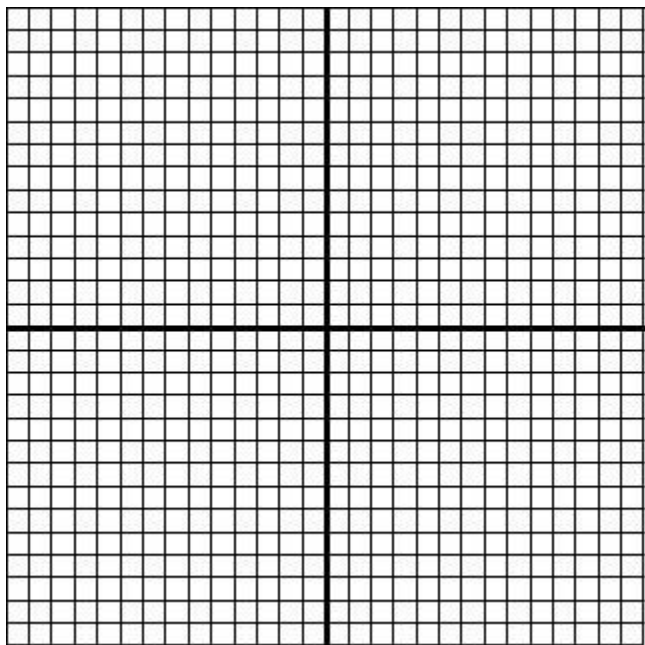
b) $g(x) = \frac{-1}{x+2} - 1$

c) $g(x) = \frac{1}{\frac{1}{2}(x+1)} - 0.5$

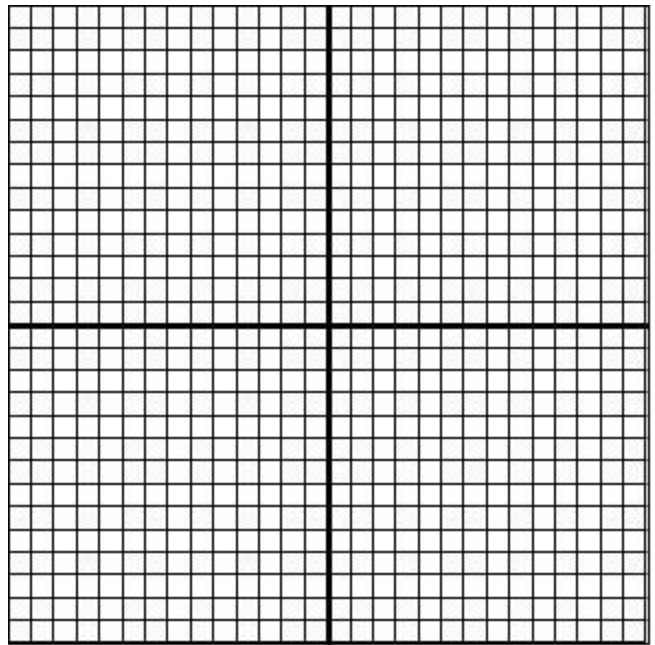
2) Describe the transformations to the parent function $f(x) = \frac{1}{x}$ in order, make a table of values of image points, write the equation of the transformed function and graph it.

a) $g(x) = f\left[\frac{1}{2}(x + 1)\right]$

b) $g(x) = 2f(-x)$



c) $g(x) = -f[-2(x - 0.5)] + 1$



3) Use the description to write the transformed function, $g(x)$.

a) The parent function, $f(x) = \frac{1}{x}$, is compressed vertically by a factor of $\frac{1}{3}$ and then translated (shifted) 3 units left.

b) The parent function, $f(x) = \frac{1}{x}$, is reflected over the x-axis, stretch horizontally by a factor of 3 and then translated 1 unit left and 4 units down.

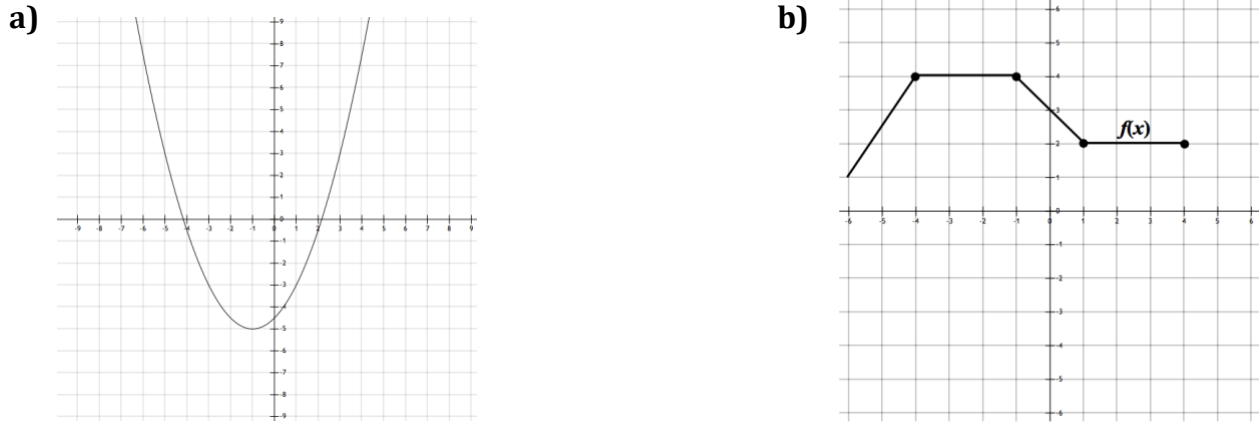
W5 - Inverse of a Function

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1) Sketch the graph of the inverse of each function. Is the inverse of $f(x)$ a function? Explain.



2) Determine the equation of the inverse of each function.

a) $f(x) = 2x$

b) $f(x) = 6x - 5$

c) $f(x) = \frac{2x+4}{5}$

3) Determine the equation of the inverse of each function

a) $f(x) = x^2 + 6$

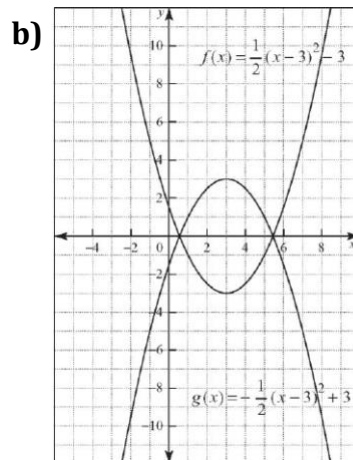
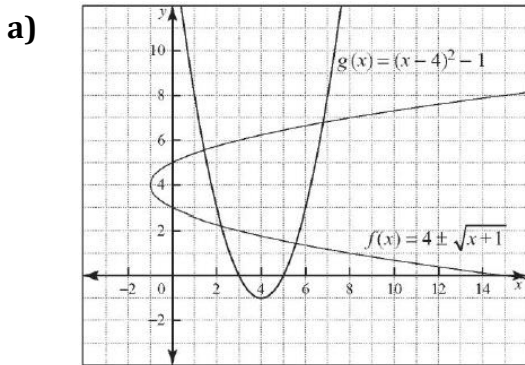
b) $f(x) = (x + 8)^2$

4) For each quadratic function, complete the square and then determine the equation of the inverse.

a) $f(x) = x^2 + 6x + 15$

b) $f(x) = 2x^2 + 24x - 3$

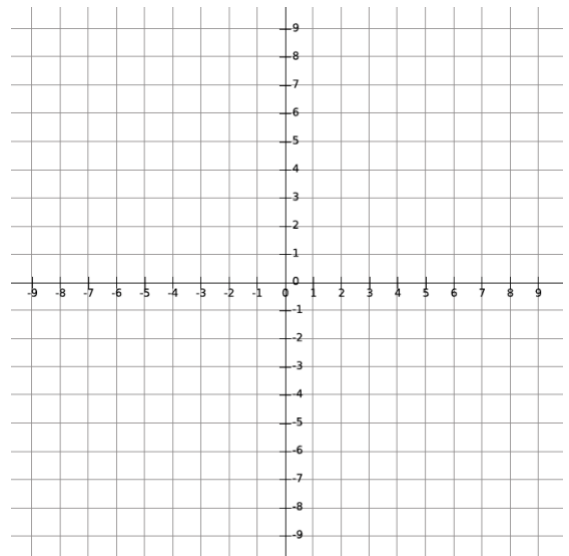
5) Determine if the two relations shown are inverses of each other. Justify your conclusion.



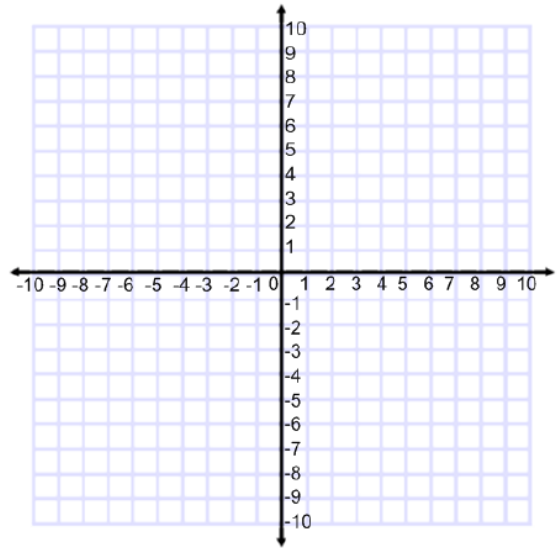
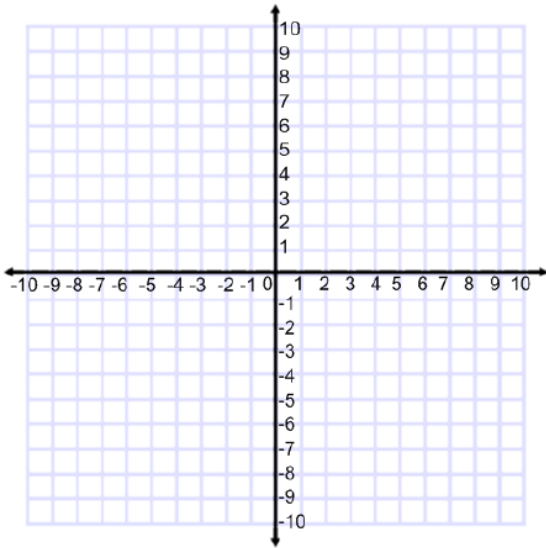
6) For the function $f(x) = -5x + 6$

a) determine $f^{-1}(x)$

b) Graph $f(x)$ and its inverse



7) Use transformations to graph the function $f(x) = 2(x - 2)^2 + 1$. Find the inverse function $f^{-1}(x)$ and graph it by reflecting $f(x)$ over the line $y = x$ (switch x and y co-ordinates)



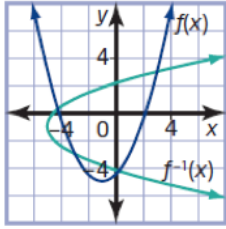
8) Determine the equation of the inverse for the given functions and state the domain and range.

a) $f(x) = \sqrt{x + 3}$

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

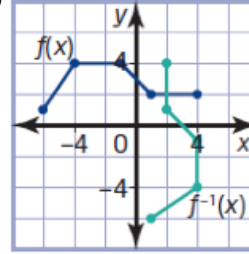
Answers

1) a)



the inverse is NOT a function

b)



inverse is NOT a function

2) a) $f^{-1}(x) = \frac{x}{2}$ b) $f^{-1}(x) = \frac{x+5}{6}$ c) $f^{-1}(x) = \frac{5x-4}{2}$

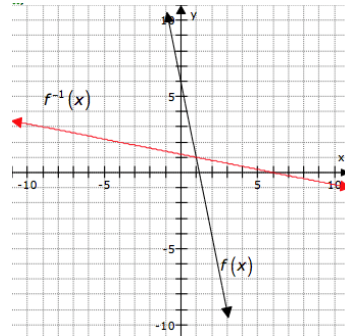
3) a) $f^{-1}(x) = \pm\sqrt{x-6}$ b) $f^{-1}(x) = \pm\sqrt{x} - 8$

4) a) $f^{-1}(x) = \pm\sqrt{x-6} - 3$ b) $f^{-1}(x) = \pm\sqrt{\frac{x+75}{2}} - 6$

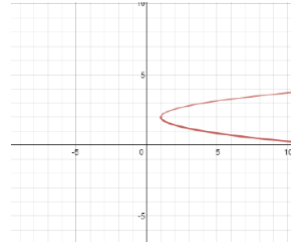
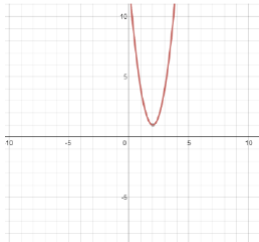
5) a) yes b) no

6) a) $f^{-1}(x) = \frac{-x+6}{5}$

b)



7) $f^{-1}(x) = 2 \pm \sqrt{\frac{x-1}{3}}$



8) a) $f^{-1}(x) = x^2 - 3$; Domain for $f(x)$: $\{X \in \mathbb{R} | x \geq -3\}$, Range for $f(x)$: $\{Y \in \mathbb{R} | y \geq 0\}$
 Domain for $f^{-1}(x)$: $\{X \in \mathbb{R} | x \geq 0\}$, Range for $f(x)$: $\{Y \in \mathbb{R} | y \geq -3\}$

b) $f^{-1}(x) = \frac{3}{x-2} + 2$; Domain for $f(x)$: $\{X \in \mathbb{R} | x \neq 2\}$, Range for $f(x)$: $\{Y \in \mathbb{R} | y \neq 2\}$
 Domain for $f^{-1}(x)$: $\{X \in \mathbb{R} | x \neq 2\}$, Range for $f(x)$: $\{Y \in \mathbb{R} | y \neq 2\}$