

Chapter 1

Check Your Understanding

Section 1.1

Practise

1. Identify the values of the parameters h and k for each of the following functions.

a) $y = f(x - 10)$ $h = \underline{\hspace{2cm}}$ $k = \underline{\hspace{2cm}}$

b) $y - 3 = f(x + 2)$ $h = \underline{\hspace{2cm}}$ $k = \underline{\hspace{2cm}}$

c) $y = f(x - 17) + 13$ $h = \underline{\hspace{2cm}}$ $k = \underline{\hspace{2cm}}$

d) $y + 7 = (x + 1)^2$ $h = \underline{\hspace{2cm}}$ $k = \underline{\hspace{2cm}}$

e) $y - 4 = |x|$ $h = \underline{\hspace{2cm}}$ $k = \underline{\hspace{2cm}}$

You may need
to rearrange the
equation before
answering.

2. Given $h = 2$ and $k = -5$, write an equation for each transformed function $y - k = f(x - h)$.

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

b) $f(x) = |x|$

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

3. Describe, using mapping notation, how the graphs of the following functions can be obtained from the graph of $y = f(x)$. Then, describe each transformation in words.

a) $y = f(x - 25)$ $(x, y) \rightarrow$ _____

This represents a _____ translation _____ by _____ units.
(horizontal or vertical) (right/left/up/down)

b) $y + 50 = f(x)$ $(x, y) \rightarrow$ _____

This represents a _____ translation _____ by _____ units.
(horizontal or vertical) (right/left/up/down)

c) $y - 10 = f(x + 20)$ $(x, y) \rightarrow$ _____.

This represents a _____



See also #8 on page 13 of *Pre-Calculus I*.

4. Given the graph of $y = f(x)$, graph the transformed function on the same set of axes. Write the transformation using mapping notation.

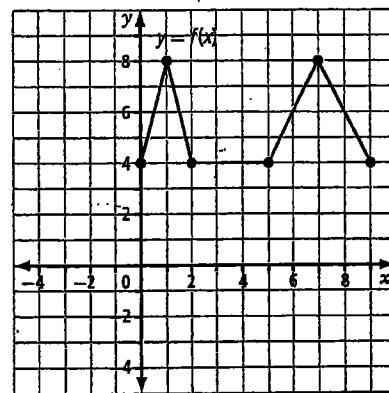
a) Graph $y + 7 = f(x + 2)$.

$h = \underline{\hspace{2cm}}$ means a horizontal translation $\underline{\hspace{2cm}}$ units to the $\underline{\hspace{2cm}}$
(left or right)

$k = \underline{\hspace{2cm}}$ means a vertical translation $\underline{\hspace{2cm}}$ units $\underline{\hspace{2cm}}$
(up or down)

Key points: (x, y) maps to $(x + h, y + k)$

(x, y)	\rightarrow	$(x + h, y + k)$
$(0, 4)$	\rightarrow	

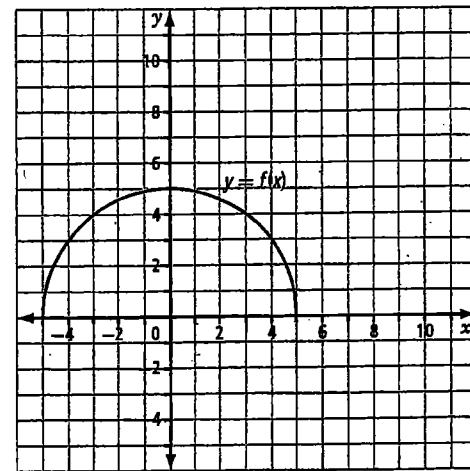


Verify that your mapping is correct
by checking that the translated
function is congruent to the base.

b) Graph $y + 2 = f(x - 5)$.

Key points:

(x, y)	\rightarrow	$(x + h, y + k)$



Apply

5. The graph of the function $f(x) = x^2$ is translated 6 units to the right and 4 units down to form the transformed function $y = g(x)$.

a) Identify the values of the parameters h and k . $h = \underline{\hspace{2cm}}$ $k = \underline{\hspace{2cm}}$

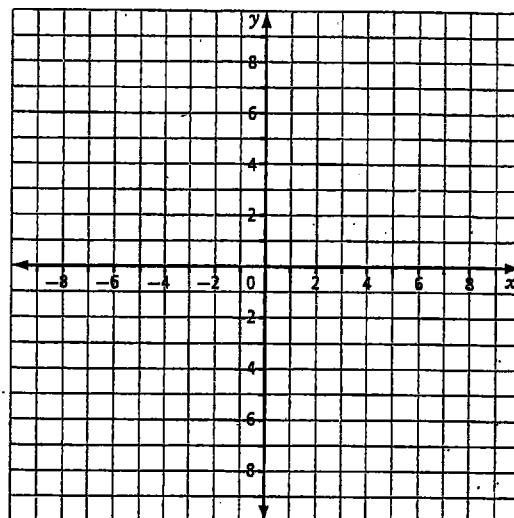
b) Write the transformation $f(x) \rightarrow g(x)$ using mapping notation.

c) Determine the equation of the function $y = g(x)$. $\underline{\hspace{2cm}}$

d) Graph $f(x)$ and $g(x)$ on the same set of axes.

Key points:

(x, y)	\rightarrow	$(x + h, y + k)$



- e) Compare the vertex of $f(x)$ to that of $g(x)$. What do you notice?

Vertex of $f(x)$:

Vertex of $g(x)$:

- f) Compare the domain and range of $f(x)$ to those of $g(x)$. What do you notice?

Domain of $f(x)$:

Domain of $g(x)$:

Range of $f(x)$:

Range of $g(x)$:

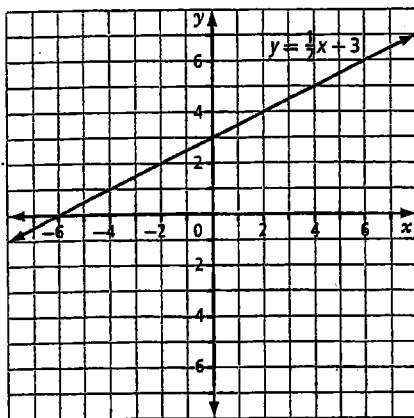
Check Your Understanding

Section 6.2

Practise

1. Graph the horizontal reflection (reflection in the y -axis) of each function. State the equation of the reflected function in simplified form. Note any features of the function that change and any that stay the same.

a)

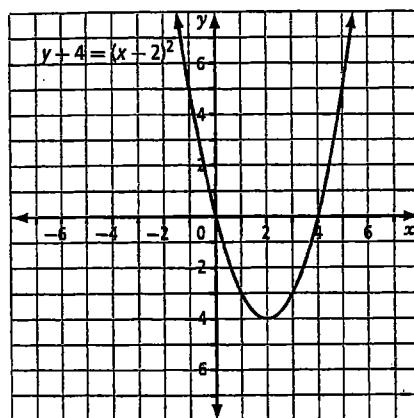


Equation of function: $y = \frac{1}{2}x + 3$

Equation of reflected function:

Notes:

b)

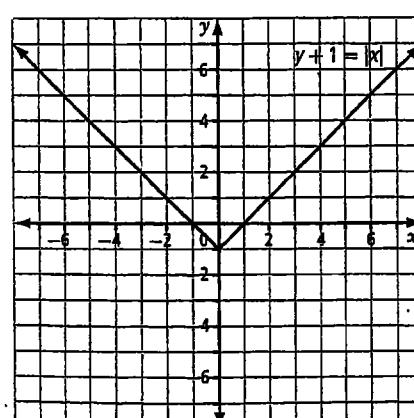


Equation of function: $y + 4 = (x - 2)^2$

Equation of reflected function:

Notes:

c)



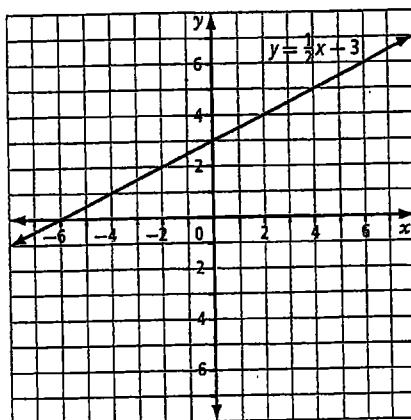
Equation of function: $y + 1 = |x|$

Equation of reflected function:

Notes:

2. Graph the vertical reflection (reflection in the x -axis) of each function. State the equation of the reflected function in simplified form. Note any features of the function that change and any that stay the same.

a)

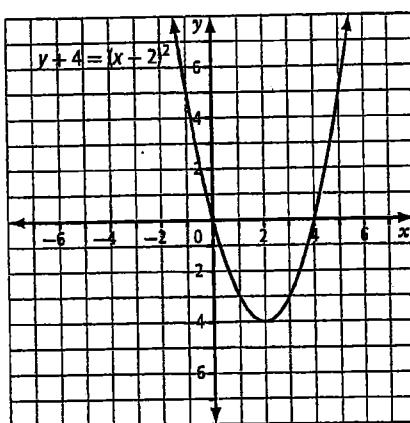


Equation of function: $y = \frac{1}{2}x + 3$

Equation of reflected function:

Notes:

b)

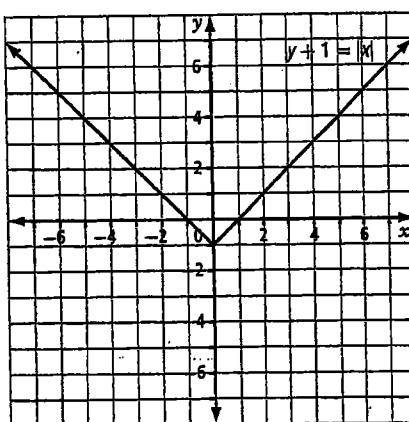


Equation of function: $y + 4 = (x - 2)^2$

Equation of reflected function:

Notes:

c)



Equation of function: $y + 1 = |x|$

Equation of reflected function:

Notes:

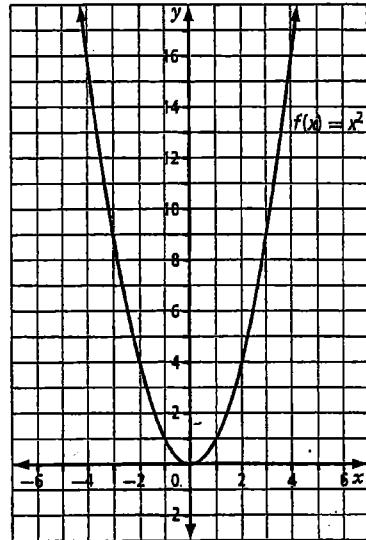
3. Given $f(x) = x^2$, graph the following transformations. Give the equation and mapping notation for each transformation.

a) vertical stretch by a factor of $\frac{1}{4}$

Key points: (x, y) maps to (x, ay)

(x, y)	\rightarrow	
$(0, 0)$	\rightarrow	
$(\pm 1, 1)$	\rightarrow	
$(\pm 2, 4)$	\rightarrow	
$(\pm 3, 9)$	\rightarrow	
$(\pm 4, 16)$	\rightarrow	

Equation: _____

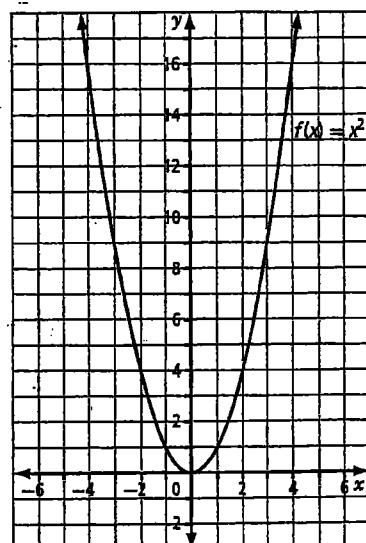


- b) horizontal stretch by a factor of 2 ($b = \text{reciprocal of the stretch factor}$)

Key points: (x, y) maps to $(\frac{1}{b}x, y)$

(x, y)	\rightarrow	
$(0, 0)$	\rightarrow	
$(\pm 1, 1)$	\rightarrow	
$(\pm 2, 4)$	\rightarrow	
$(\pm 3, 9)$	\rightarrow	
$(\pm 4, 16)$	\rightarrow	

Equation: _____



4. Compare your answers in parts a) and b) of #3.

a) Show algebraically why both transformations result in the same transformed function.

b) Give another example of a pair of horizontal and vertical stretches that would result in the same transformed function.

Check Your Understanding Section 1-3

Practise

1. Describe, in order, the transformations represented by each equation.

You may need to factor the equation before answering.

a) $y + 5 = 4f(-x)$

b) $y = -f(2x + 14)$

i)

i)

ii)

ii)

iii)

iii)

c) $y = 1.75f[0.25(x - 1.5)]$

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

i)

i)

ii)

ii)

iii)

iii)

2. Determine the equation of each transformed function.

a) $y = f(x)$ is stretched horizontally by a factor of 6, reflected in the x -axis, and translated 7 units down.

b) $y = |x|$ is reflected in the y -axis, stretched vertically by a factor of $\frac{1}{2}$, and translated 3 units to the right.

c) $y = x^2$ is reflected in the x -axis, stretched horizontally by a factor of 3, and translated so that the vertex is at $(10, -4)$.

3. The key point $(1, 10)$ is on the graph of $y = f(x)$. Determine the coordinates of its image point under each transformation.

a) $y + 4 = f(x - 5)$

$(x, y) \rightarrow$

$(1, 10) \rightarrow$

b) $y = -f(x + 12)$

$(x, y) \rightarrow$

$(1, 10) \rightarrow$

c) $y = 3f(-0.5x + 10)$

$(x, y) \rightarrow$

$(1, 10) \rightarrow$



This is similar to #6 on page 19 of Pre-Calculus 11.

4. If the key point $(-2, -8)$ is on the graph of $y = f(x)$, determine the coordinates of its image point under each of the transformations in #3.

Apply

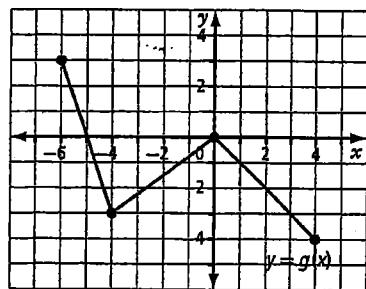
5. The graph of the function $y = g(x)$ is given. Graph each of the following transformations of the function. Show each stage of the transformation in a different colour.

a) $y + 2 = -g(2x)$

i)

ii)

iii)

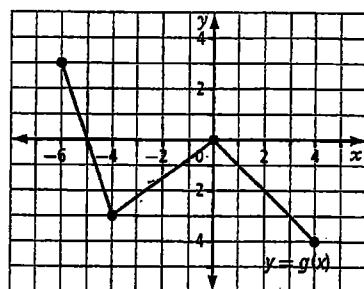


b) $y = g(-4x + 12)$

i)

ii)

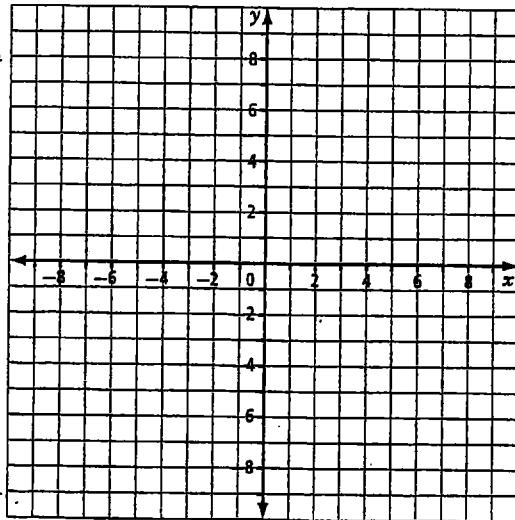
iii)



6. The graph of the function $f(x) = |x|$ is stretched vertically by a factor of 2, reflected in the x -axis, and translated 6 units to the left and 3 units down to form the transformed function $y = g(x)$.

- a) Determine the equation of the function $y = g(x)$.

- b) Graph $y = g(x)$.

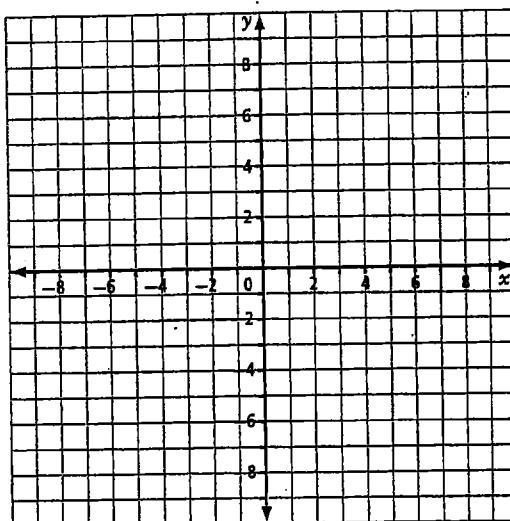


Start by graphing the base function $y = f(x)$.

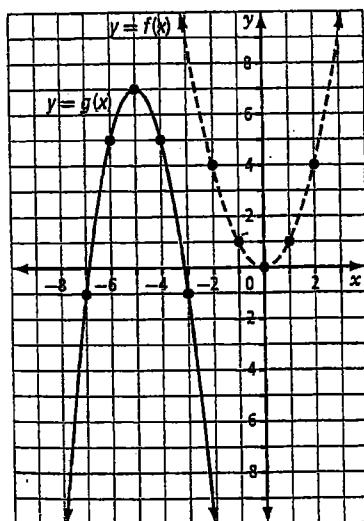
7. The graph of the function $f(x) = \frac{1}{x}$ is stretched horizontally by a factor of 4, reflected in the x -axis, and translated 4 units to the right and 1 unit down to form the transformed function $y = g(x)$.

a) Determine the equation of the function $y = g(x)$.

b) Graph $y = g(x)$.

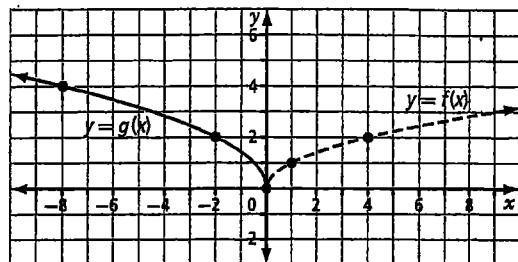


8. Determine an equation for $g(x)$ of the form $y - k = af(b(x - h))$ given the graphs of $y = f(x)$ and the transformed function $y = g(x)$.



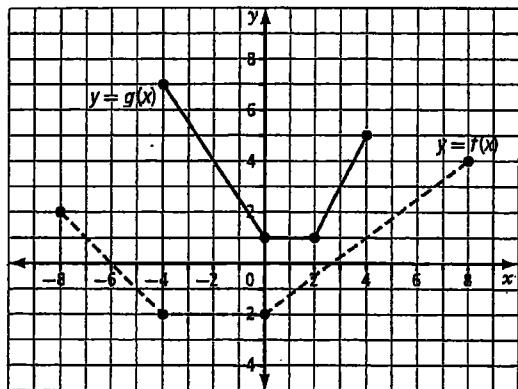
Equation:

9. Determine an equation for $g(x)$ of the form $y - k = af(b(x - h))$ given the graphs of $y = f(x)$ and the transformed function $y = g(x)$.



Equation:

10. Determine an equation of the form $y - k = af(b(x - h))$ given the following graphs of $y = f(x)$ and of the transformed function $y = g(x)$.



Consider each of the possible types of transformations in reverse order: translations, vertical stretches and reflections, and horizontal stretches and reflections.

For additional similar questions, see #10 on page 40 of *Pre-Calculus 12*.

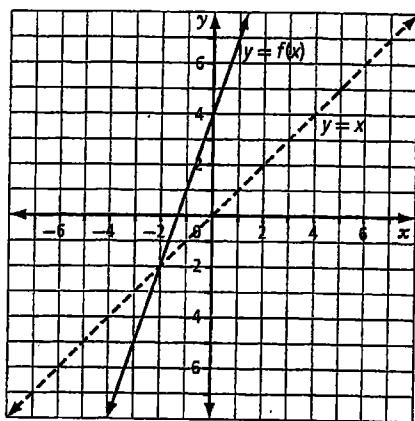
Check Your Understanding

Section 1.4

Practise

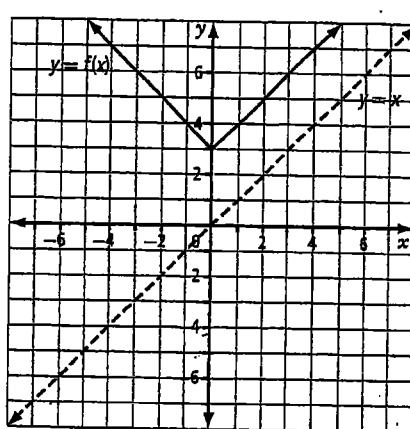
1. Graph the inverse relation of each function below. Determine whether the inverse is a function. Identify any invariant points.

a)



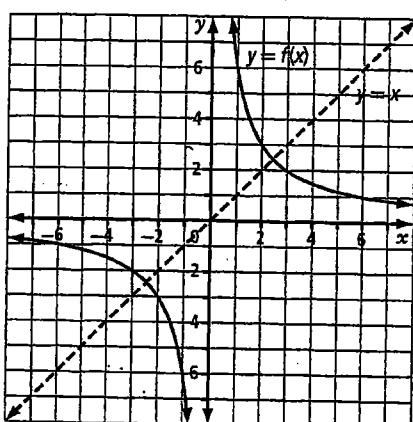
The inverse of $f(x)$ _____ a function.
(is or is not)

b)



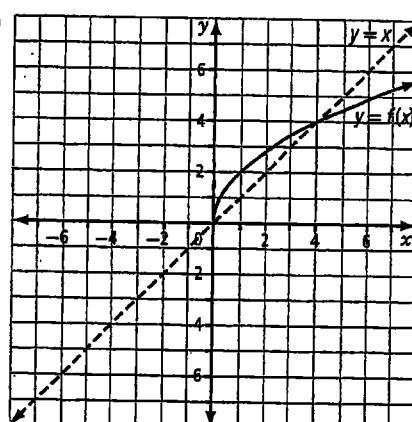
The inverse of $f(x)$ _____ a function.
(is or is not)

c)

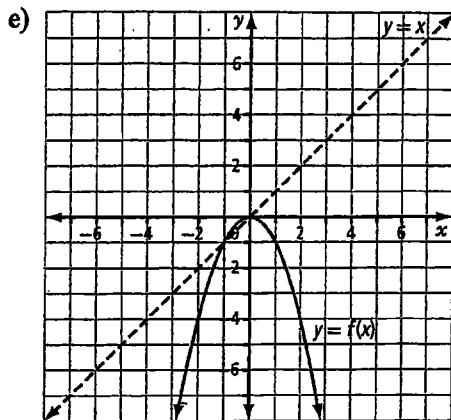


The inverse of $f(x)$ _____ a function.
(is or is not)

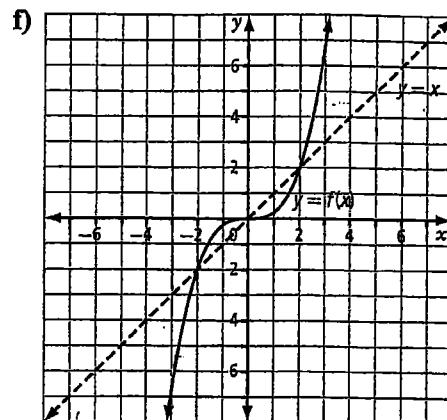
d)



The inverse of $f(x)$ _____ a function.
(is or is not)



The inverse of $f(x)$ _____ a function.
 (is or is not)



The inverse of $f(x)$ _____ a function.
 (is or is not)

2. Determine algebraically the inverse of each function. Verify by sketching the graph of the function and its inverse.

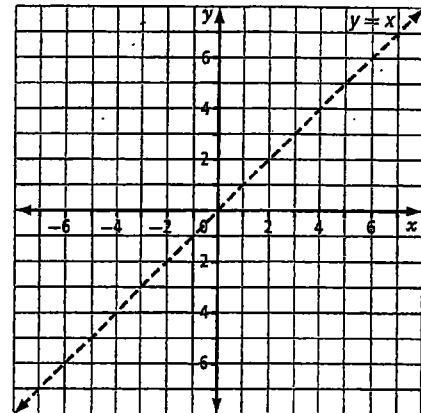
a) $f(x) = x - 4$

Steps:

1. Substitute y for $f(x)$.

2. Interchange x and y .

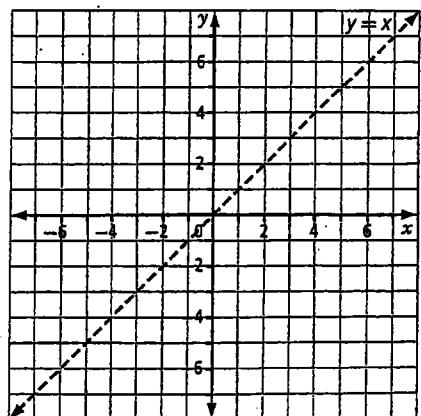
3. Solve for y .



4. Restrict the domain if necessary. Then, substitute $f^{-1}(x)$ for y .

The inverse of $f(x) = x - 4$ is $f^{-1}(x) =$ _____

b) $f(x) = -6x - 2$



The inverse of $f(x) = -6x - 2$ is

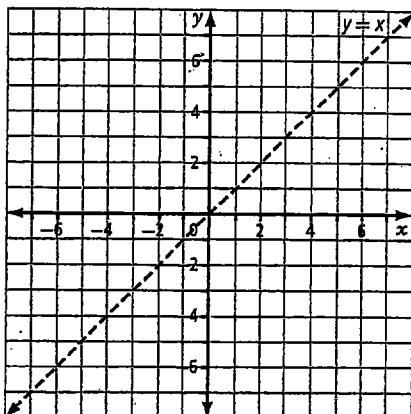
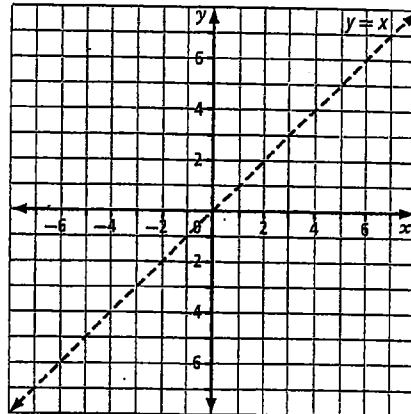
$f^{-1}(x) =$ _____

c) $f(x) = \frac{3}{5}x - 3$

The inverse of $f(x) = \frac{3}{5}x - 3$ is
 $f^{-1}(x) = \underline{\hspace{2cm}}$

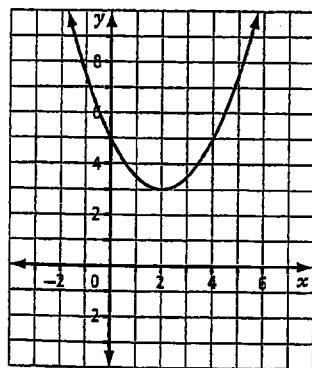
d) $f(x) = \frac{1}{2}(x + 6)$

The inverse of $f(x) = \frac{1}{2}(x + 6)$ is
 $f^{-1}(x) = \underline{\hspace{2cm}}$



3. For each graph, identify a restricted domain for which the function has an inverse that is also a function.

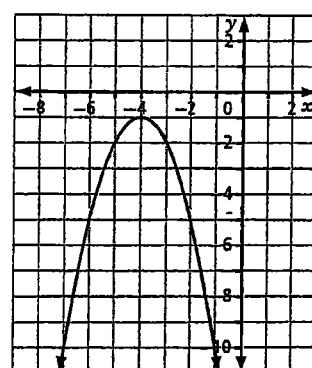
a)



Axis of symmetry: _____

Domain: _____

b)



Axis of symmetry: _____

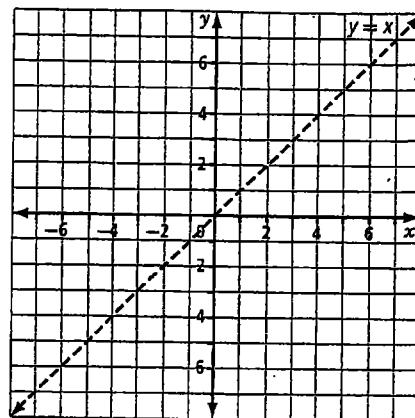
Domain: _____

4. Determine algebraically the inverse of each function. Restrict the domain of the base function so that the inverse is a function. Verify by sketching the graph of the function and its inverse.

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

Steps:

1. Substitute y for $f(x)$.
2. Interchange x and y .
3. Solve for y .



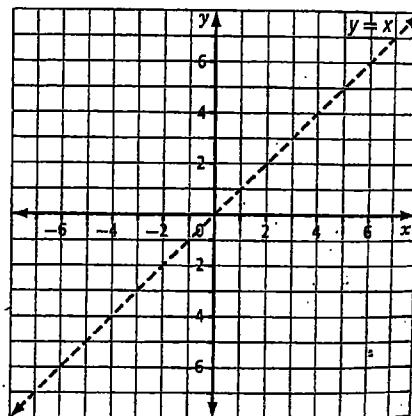
4. Restrict the domain if necessary. Then, substitute $f^{-1}(x)$ for y .

The inverse of $f(x) = -x^2 + 6$, _____, is $f^{-1}(x) =$ _____

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

Steps:

1. Substitute y for $f(x)$.
2. Interchange x and y .
3. Solve for y .



4. Restrict the domain if necessary. Then, substitute $f^{-1}(x)$ for y .

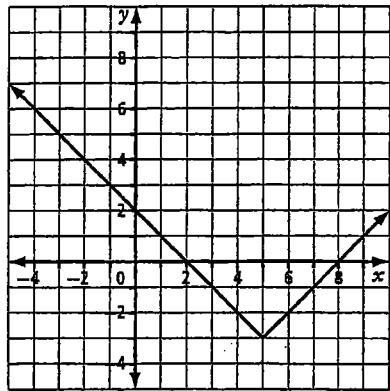
The inverse of $f(x) = \frac{1}{2}x^2 + 4$, _____, is $f^{-1}(x) =$ _____

Chapter 1 Review

1.1 Horizontal and Vertical Translations, pages 1–8

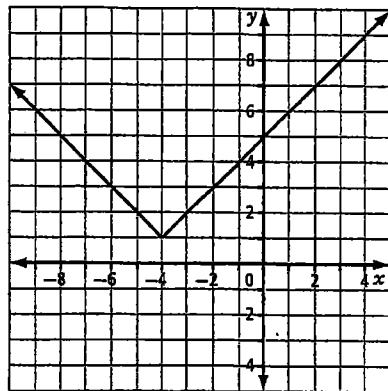
1. Write an equation to represent each translation of the function $y = |x|$.

a)



Equation: _____

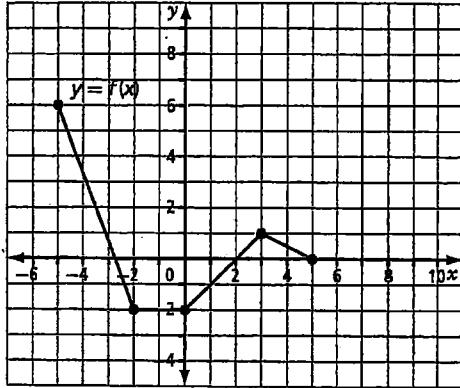
b)



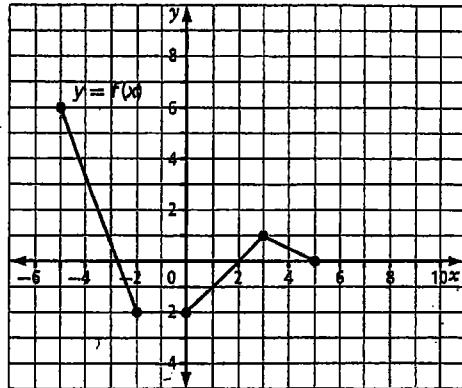
Equation: _____

2. For $y = f(x)$ as shown, graph the following.

a) $y - 2 = f(x - 3)$



b) $y + 2 = f(x + 1)$



1.2 Reflections and Stretches, pages 9–17

3. The key point $(12, -5)$ is on the graph of $y = f(x)$. Determine the coordinates of its image point under each transformation.

a) $y = -f(x)$

$(x, y) \rightarrow$

$(12, -5) \rightarrow$

b) $y = f(-4x)$

$(x, y) \rightarrow$

$(12, -5) \rightarrow$

c) $y = 2f\left(\frac{1}{3}x\right)$

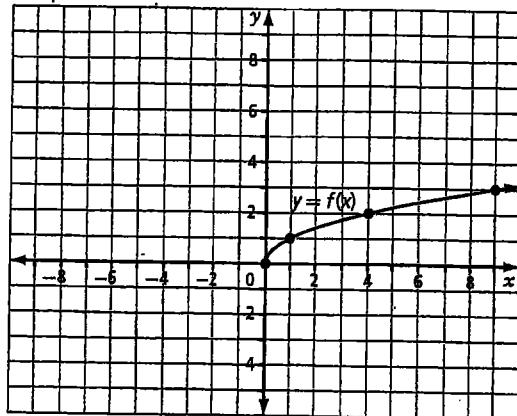
$(x, y) \rightarrow$

$(12, -5) \rightarrow$

4. Describe the following transformations of $y = f(x)$ and sketch a graph of each transformation.

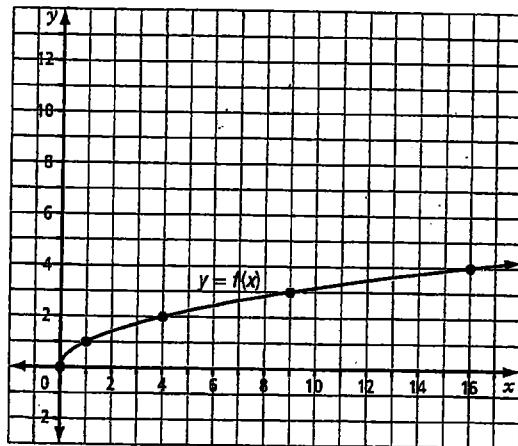
a) $y = -f(-x)$

Description:



b) $y = 3f(2x)$

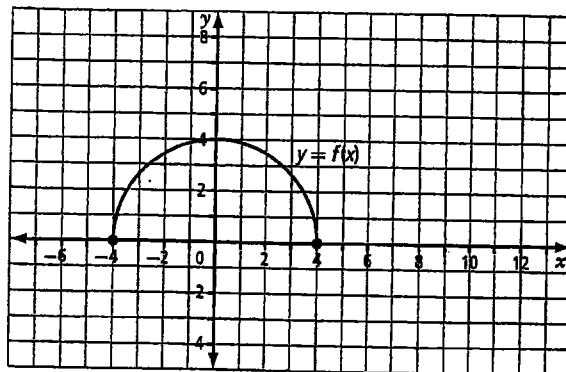
Description:



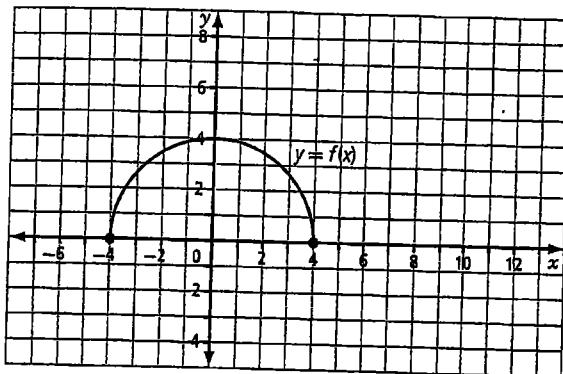
1.3 Combining Transformations, pages 18–25

5. The graph of the function $y = f(x)$ is given. Graph each of the following transformations of the function. Show each stage of the transformation in a different colour.

a) $y = 5 - \frac{1}{2}f\left(\frac{2}{3}(x - 6)\right)$



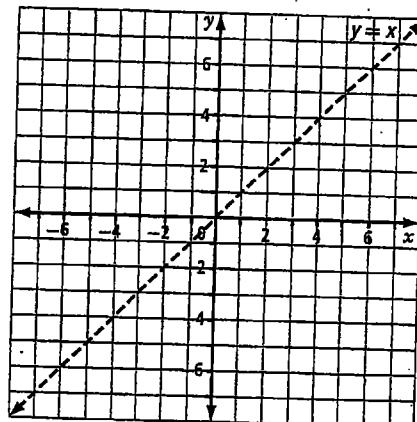
b) $y = -f(4x + 12)$



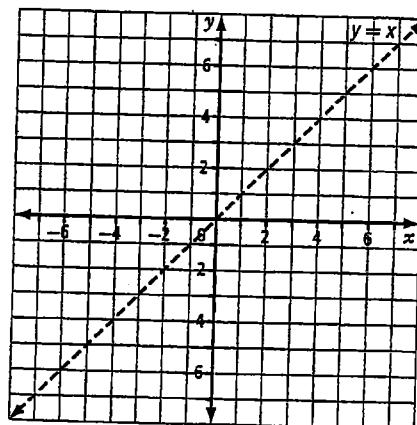
1.4 Inverse of a Relation, pages 26–34

6. Determine algebraically the inverse of each function. If necessary, restrict the domain so that the inverse of $f(x)$ is also a function. Verify by sketching the graph of the function and its inverse.

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



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

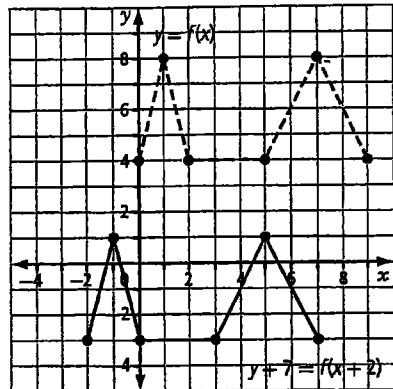


Answers

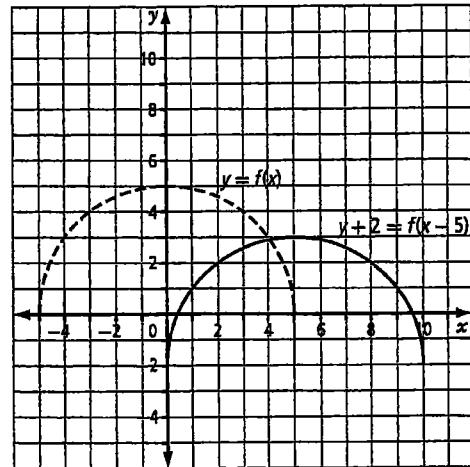
Chapter 1

1.1 Horizontal and Vertical Translations, pages 1–8

1. a) $h = 10, k = 0$ b) $h = -2, k = 3$
 c) $h = 17, k = 13$ d) $h = -1, k = -7$
 e) $h = 0, k = 4$
2. a) $y + 5 = (x - 2)^2$ b) $y + 5 = |x - 2|$
 c) $y + 5 = \frac{1}{x-2}, x \neq 2$
3. a) $(x, y) \rightarrow (x + 25, y)$; horizontal translation
25 units to the right
 b) $(x, y) \rightarrow (x, y - 50)$; vertical translation 50 units
down
 c) $(x, y) \rightarrow (x - 20, y + 10)$; horizontal translation
20 units to the left and vertical translation
10 units up
4. a) $(x, y) \rightarrow (x - 2, y - 7)$

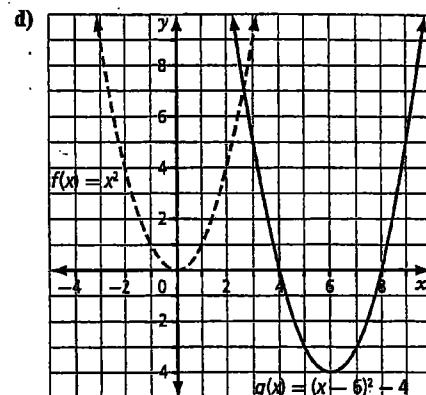


b) $(x, y) \rightarrow (x + 5, y - 2)$



5. a) $h = 6, k = -4$ b) $(x, y) \rightarrow (x + 6, y - 4)$

c) $y = (x - 6)^2 - 4$



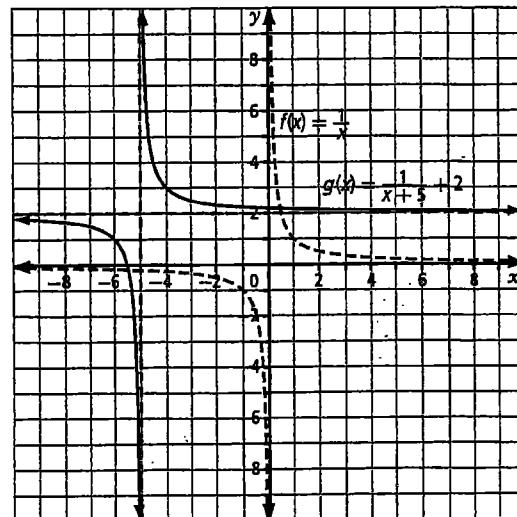
- e) $(0, 0), (6, -4)$; vertex has coordinates (h, k)

f) domain of each function: $\{x \mid x \in \mathbb{R}\}$;
 range of $f(x)$: $\{y \mid y \geq 0, y \in \mathbb{R}\}$, range of
 $g(x)$: $\{y \mid y \geq -4, y \in \mathbb{R}\}$; in general, the
 range is $\{y \mid y \geq k, y \in \mathbb{R}\}$

6. a) $h = -5, k = 2$ b) $(x, y) \rightarrow (x - 5, y + 2)$

c) $y = \frac{1}{x+5} + 2$

d)

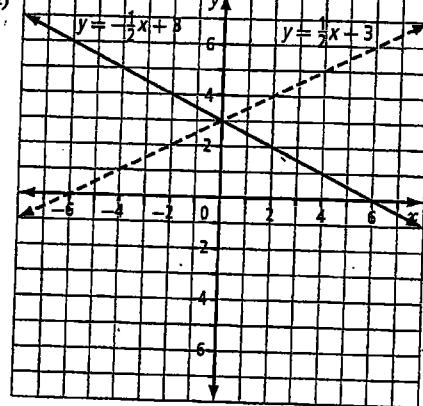


- e) For $f(x)$: domain $\{x \mid x \neq 0, x \in \mathbb{R}\}$, range
 $\{y \mid y \neq 0, y \in \mathbb{R}\}$, asymptotes $y = 0, x = 0$;
 For $g(x)$: domain $\{x \mid x \neq -5, x \in \mathbb{R}\}$, range
 $\{y \mid y \neq 2, y \in \mathbb{R}\}$, asymptotes $y = 2, x = -5$;
 restriction on the domain of $g(x)$ is $x \neq h$,
 restriction on the range of $g(x)$ is $y \neq k$,
 asymptotes are at $x = h$ and $y = k$

Function	Horizontal Translation		Vertical Translation	
	to the right 1 unit	to the left 3 units	up 2 units	down 4 units
Quadratic $y = x^2$	$y = (x - 1)^2$ $(x, y) \rightarrow (x + 1, y)$ vertex at $(1, 0)$	$y = (x + 3)^2$ $(x, y) \rightarrow (x - 3, y)$ vertex at $(-3, 0)$	$y - 2 = x^2$ $(x, y) \rightarrow (x, y + 2)$ vertex at $(0, 2)$	$y + 4 = x^2$ $(x, y) \rightarrow (x, y - 4)$ vertex at $(0, -4)$
Absolute value $y = x $	$y = x - 1 $ $(x, y) \rightarrow (x + 1, y)$ vertex at $(1, 0)$	$y = x + 3 $ $(x, y) \rightarrow (x - 3, y)$ vertex at $(-3, 0)$	$y - 2 = x $ $(x, y) \rightarrow (x, y + 2)$ vertex at $(0, 2)$	$y + 4 = x $ $(x, y) \rightarrow (x, y - 4)$ vertex at $(0, -4)$
Reciprocal $y = \frac{1}{x}$	$y = \frac{1}{x-1}$ $(x, y) \rightarrow (x + 1, y)$ vertical asymptote; $x = 1$; horizontal asymptote: $y = 0$	$y = \frac{1}{x+3}$ $(x, y) \rightarrow (x - 3, y)$ vertical asymptote; $x = -3$; horizontal asymptote: $y = 0$	$y - 2 = \frac{1}{x}$ $(x, y) \rightarrow (x, y + 2)$ vertical asymptote; $x = 0$; horizontal asymptote: $y = 2$	$y + 4 = \frac{1}{x}$ $(x, y) \rightarrow (x, y - 4)$ vertical asymptote; $x = 0$; horizontal asymptote: $y = -4$
Any function $y = f(x)$	$y = f(x - 1)$ $(x, y) \rightarrow (x + 1, y)$	$y = f(x + 3)$ $(x, y) \rightarrow (x - 3, y)$	$y - 2 = f(x)$ $(x, y) \rightarrow (x, y + 2)$	$y + 4 = f(x)$ $(x, y) \rightarrow (x, y - 4)$

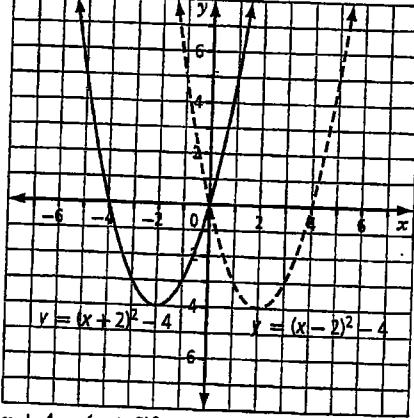
1.2 Reflections and Stretches, pages 9–17

1.



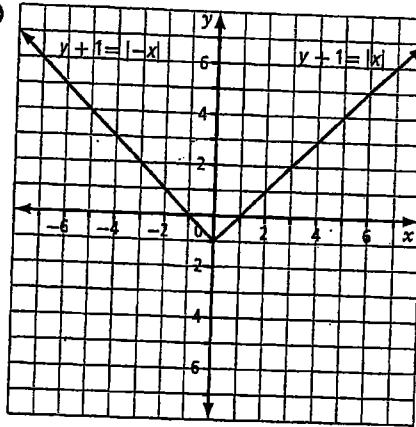
$y = -\frac{1}{2}x + 3$; same y -intercept, different x -intercepts, opposite slopes, same domain and range

b)



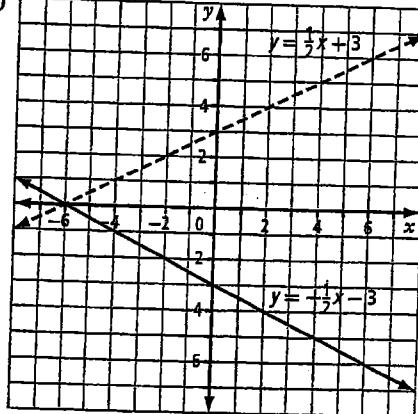
$y + 4 = (x + 2)^2$; same y -intercept, different x -intercepts, same domain and range, same shape, same orientation, vertex has opposite x -coordinate (h) but same y -coordinate (k)

c)

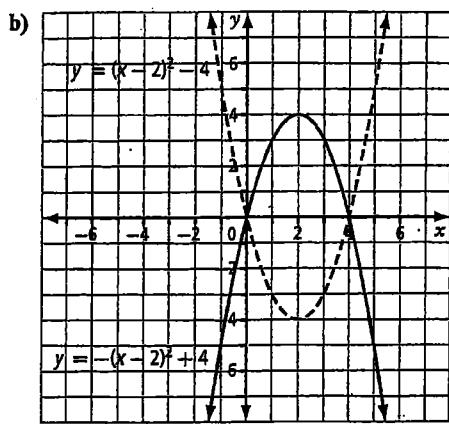


$y + 1 = |-x|$; reflection maps to the original graph

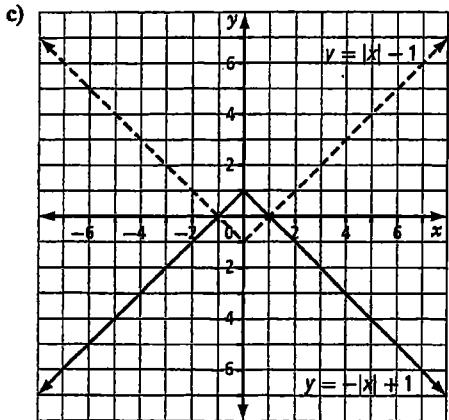
2. a)



$y = -\frac{1}{2}x - 3$; same x -intercept, different y -intercepts, opposite slopes, same domain and range

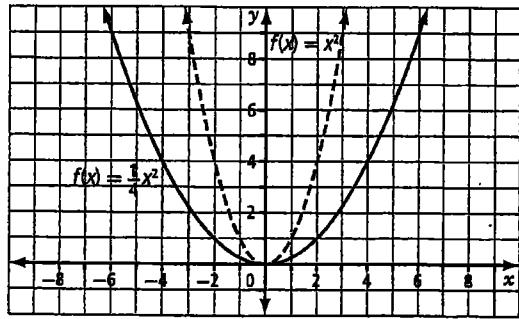


$y - 4 = -(x - 2)^2$; same y -intercept, same x -intercepts (zeros), different orientation, one has a maximum value and one has a minimum value, same shape, vertex has same x -coordinate (h) and opposite y -coordinate (k)

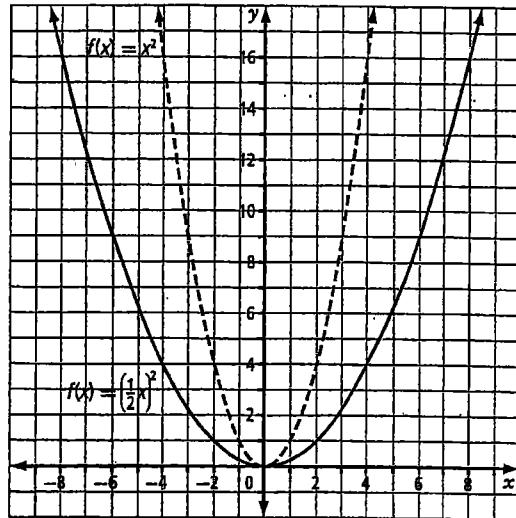


$y - 1 = -|x|$; same x -intercepts (zeros), different y -intercepts, different orientation, one has a maximum value and one has a minimum value, same shape, vertex has same x -coordinate (h) and opposite y -coordinate (k)

3. a) $(x, y) \rightarrow \left(x, \frac{1}{4}y\right); f(x) = \frac{1}{4}x^2$



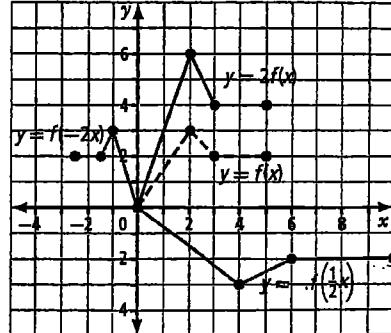
b) $(x, y) \rightarrow (2x, y); f(x) = \left(\frac{1}{2}x\right)^2$



4. a) $\left(\frac{1}{2}x\right)^2 = \left(\frac{1}{2}\right)^2 (x)^2 = \frac{1}{4}x^2$

b) Example: Given $f(x) = x^2$, any horizontal stretch by a factor of p is equivalent to a vertical stretch by a factor of $\frac{1}{p^2}$.

5. a) $y = 2f(x)$ b) $y = -f\left(\frac{1}{2}x\right)$ c) $y = f(-2x)$



6. Answers may vary.

1.3 Combining Transformations, pages 18-25

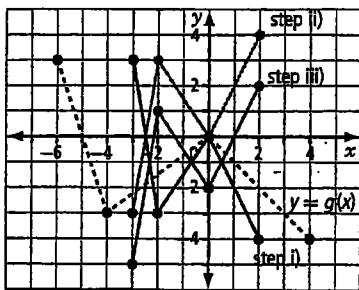
1. Steps i) and ii) may be reversed and the answer will still be correct.
 - a) i) reflection in the y -axis, ii) vertical stretch by a factor of 4, iii) translation 5 units down
 - b) i) horizontal stretch by a factor of $\frac{1}{2}$, ii) reflection in the x -axis, iii) translation 7 units to the left
 - c) i) horizontal stretch by a factor of 4, ii) vertical stretch by a factor of 1.75, iii) translation 1.5 units to the right

1. a) i) horizontal stretch by a factor of $\frac{1}{3}$ and reflection in the y -axis, ii) vertical stretch by a factor of $\frac{1}{2}$ and reflection in the x -axis, iii) translation 3 units up and 1 unit to the left

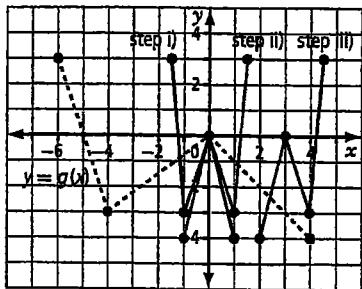
2. a) $y + 7 = -f\left(\frac{1}{6}x\right)$
 b) $y = \frac{1}{2}|-(x-3)|$
 c) $y + 4 = -\frac{1}{9}(x-10)^2$ or $y + 4 = -\left[\frac{1}{3}(x-10)\right]^2$

3. a) (6, 6)
 b) (-11, -10)
 c) (18, 30)
4. (3, -12), (-14, 8), and (24, -24)

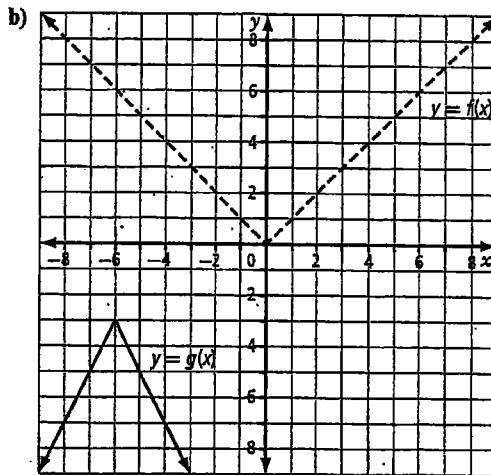
5. a) i) horizontal stretch by a factor of $\frac{1}{2}$, ii) reflection in the x -axis, iii) translation 2 units down



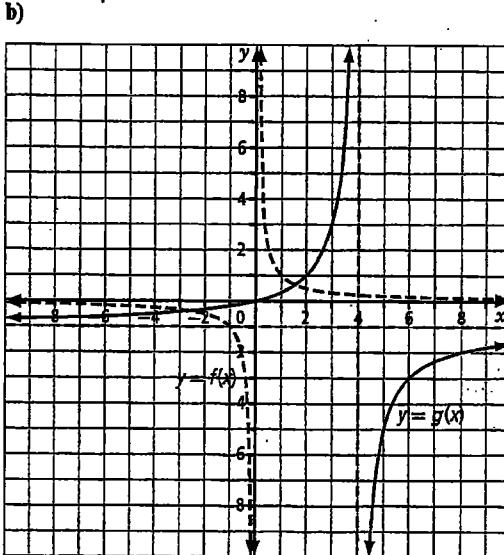
- b) i) horizontal stretch by a factor of $\frac{1}{4}$,
 ii) reflection in the y -axis,
 iii) translation 3 units to the right.



6. a) $y = -2|x + 6| - 3$



7. a) $y = -\frac{1}{4}(x-4) - 1$ or $y = -\frac{4}{x-4} - 1$



8. $y - 7 = -2f(x + 5)$

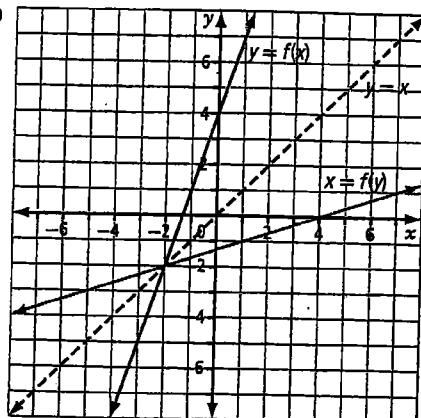
9. $y = 2f\left(-\frac{1}{2}x\right)$

10. $y = f(-2x) + 3$

11. Answers may vary.

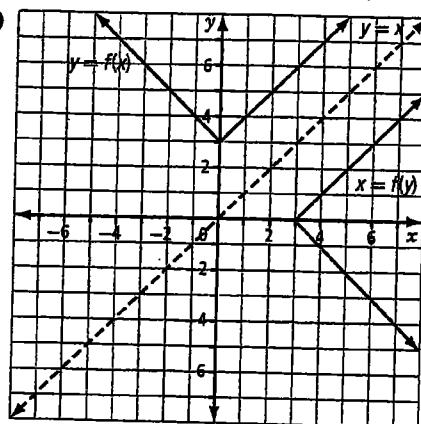
1.4 Inverse of a Relation, pages 26–34

1. a)



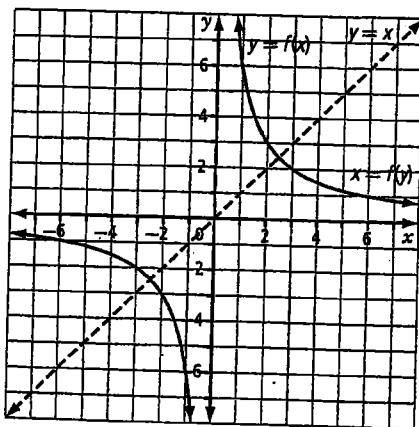
The inverse of $f(x)$ is a function; invariant points at $(-2, -2)$.

b)



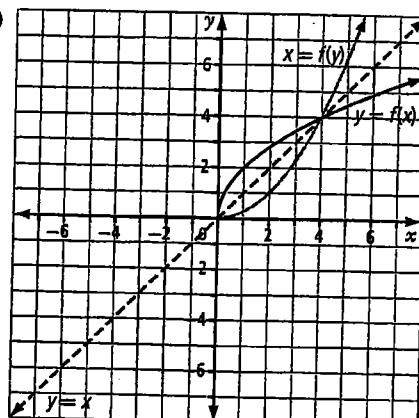
The inverse of $f(x)$ is not a function.

c)



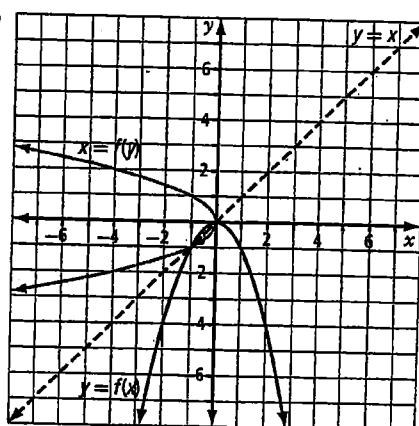
The inverse of $f(x)$ is a function; invariant points at approximately $(2.5, 2.5)$ and $(-2.5, -2.5)$.

d)



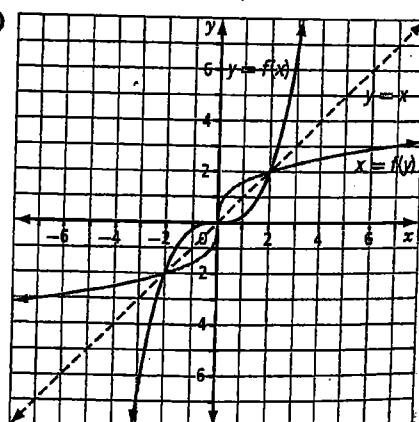
The inverse of $f(x)$ is a function; invariant points at $(0, 0)$ and $(4, 4)$.

e)



The inverse of $f(x)$ is not a function; invariant points at $(-1, -1)$ and $(0, 0)$.

f)



The inverse of $f(x)$ is a function; invariant points at $(-2, -2)$, $(0, 0)$, and $(2, 2)$.

2. a) $f^{-1}(x) = x + 4$ b) $f^{-1}(x) = -\frac{1}{6}x - \frac{1}{3}$
 c) $f^{-1}(x) = \frac{5}{3}x + 5$ d) $f^{-1}(x) = 2x - 6$

3. Examples: a) $\{x \mid x \geq 2, x \in \mathbb{R}\}$ or $\{x \mid x \leq 2, x \in \mathbb{R}\}$
 b) $\{x \mid x \geq -4, x \in \mathbb{R}\}$ or $\{x \mid x \leq -4, x \in \mathbb{R}\}$

4. a) For $f(x) = -x^2 + 6, x \geq 0$, the inverse is
 $f^{-1}(x) = \sqrt{-(x-6)}$. For $f(x) = -x^2 + 6, x \leq 0$,
 the inverse is $f^{-1}(x) = -\sqrt{-(x-6)}$.
 b) For $f(x) = \frac{1}{2}x^2 + 4, x \geq 0$, the inverse is
 $f^{-1}(x) = \sqrt{2(x-4)}$. For $f(x) = \frac{1}{2}x^2 + 4, x \leq 0$, the
 inverse is $f^{-1}(x) = -\sqrt{2(x-4)}$.

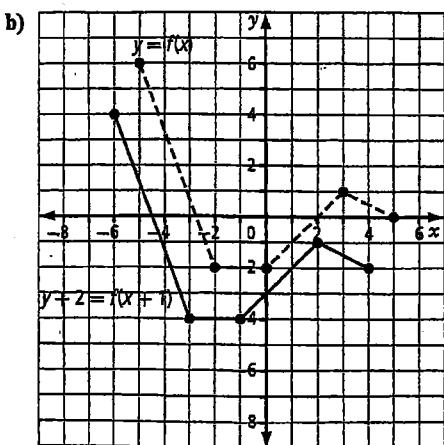
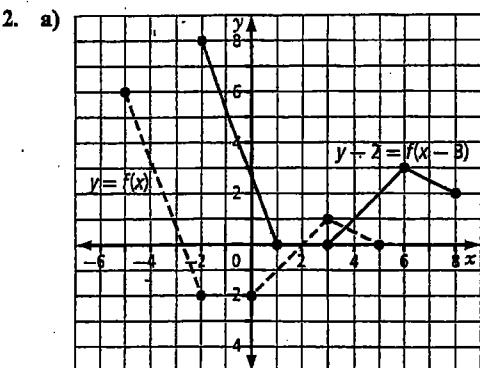
5. $y = \pm\sqrt{x+2} - 3$

6. a) $42 < x < 105$
 b) $f^{-1}(x) = \frac{x}{0.01634} + 26.643$, where $x = \text{CRL}$,
 in millimetres
 c) 14.3 weeks

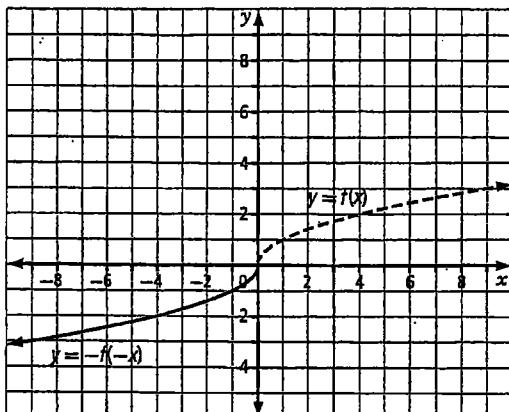
7. Answers may vary.

Chapter 1 Review, pages 35–37

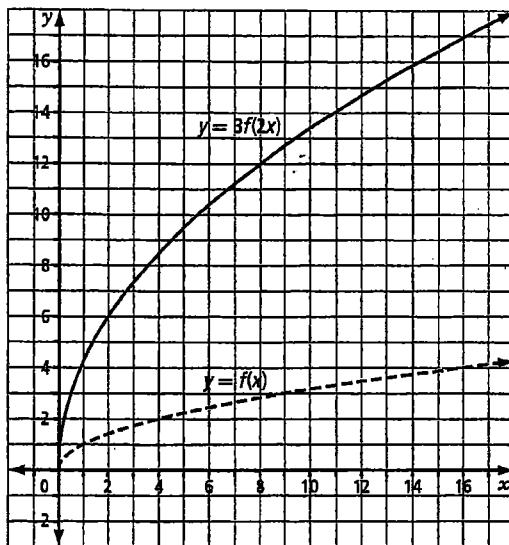
1. a) $y + 3 = |x - 5|$ b) $y - 1 = |x + 4|$



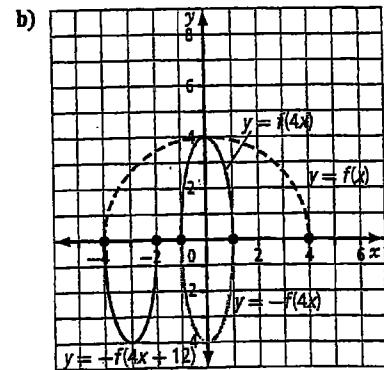
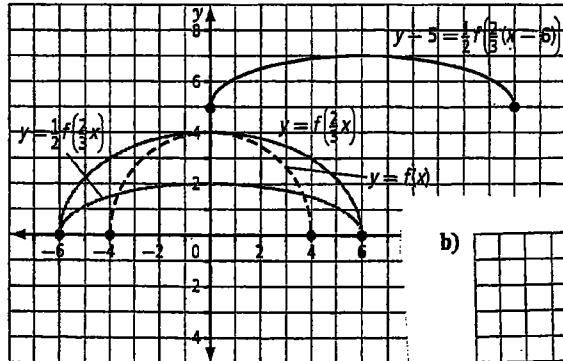
3. a) (12, 5) b) (-3, -5) c) (36, -10)
 4. a) reflection in the y -axis and reflection in the x -axis



- b) horizontal stretch by a factor of $\frac{1}{2}$, vertical stretch by a factor of 3



5. a)



6. a) $f^{-1}(x) = -2x + 10$
 b) Example: restricted domain of $f(x)$:
 $\{x \mid x \geq 1, x \in \mathbb{R}\}$, $f^{-1}(x) = \frac{1}{2}x + 1$

