Honors Algebra 2

Extra Practice Problems

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Contents

Chapter 1

Equations and Inequalities

Equations

Solve each equation. For decimal equations, round your answers to 2 decimal places.

1. $-7x + 5 = -10x + 11$
2. $\frac{2}{3}x - 10 = \frac{5}{8}$
3. $-0.2x - 3(x + 1.4) = -5.2x + 1$
4. $1.3 + 2.1(6.3x + 12) = -19.7$
5. $\frac{1}{4}x + \frac{3}{7} = -2\left(x + \frac{3}{8}\right)$
6. $\frac{1}{3}\left(\frac{2}{5}x - \frac{4}{7}\right) = 3x - 8$

Solve each for the variable indicated.

7. $F = ma$; for a
8. $PV = nRT$; for n
9. $m = \frac{y_2 - y_1}{x_2 - x_1}$; for y_2
10. $m = \frac{y_2 - y_1}{x_2 - x_1}$; for y_1
11. $v = v_0 + gt$; for t
12. $S = 180(n - 2)$; for n

Inequalities

Solve each inequality. Graph your answers on a number line.

1. $2(x + 2) \leq 4x - 2(x - 1)$
2. $-3.2x - 5(x - 1.5) > 7.7 + 1.8x$

1.1 Answer Key

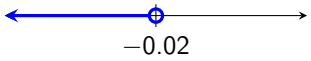
Equations

1. $x = 2$
2. $x = \frac{255}{16}$
3. $x = 2.6$
4. $x \approx -3.49$
5. $x = -\frac{11}{21}$
6. $x = \frac{820}{301}$
7. $a = \frac{F}{m}$
8. $n = \frac{PV}{RT}$
9. $y_2 = m(x_2 - x_1) + y_1$
10. $y_1 = y_2 - m(x_2 - x_1)$
11. $t = \frac{v - v_0}{g}$
12. $n = \frac{S}{180} + 2$

Inequalities

1. $\emptyset$

2. $x < -0.02$



Chapter 2

Compound Inequalities

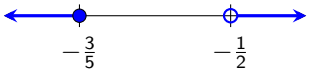
Solve each. Graph your answers on a number line.

1. $-3 < x - 8 \leq 12$
2. $7 \leq 2x - 5 < 18$
3. $x + 8 < 10$ or $5x - 9 \geq 26$
4. $x - 1.5 > 8$ or $-x + 2 > 9$
5. $4 \leq x + 7 < 9$
6. $-2 < 6x + 10 \leq 5$
7. $3x > 9$ or $-5x > 25$
8. $8x + 12 \leq 20$ or $x + 12 > 9$
9. $-8 \leq 3x + 7 < 40$
10. $-5x + 9 \geq 12$ or $2x + 6 > 5$
11. $3x - 1 < x + 5$ or $-x \geq 5 + 7x$

2.1 Answer Key

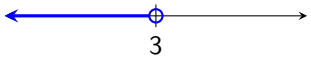
1. $5 < x \leq 20$
2. $6 \leq x < \frac{23}{2}$
3. $x < 2$ or $x \geq 7$
4. $x < -7$ or $x > \frac{19}{2}$
5. $-3 \leq x < 2$
6. $-2 < x \leq -\frac{5}{6}$
7. $x < -5$ or $x > 3$
8. $\mathbb{R}$
9. $-5 \leq x < 11$

10. $x \leq -\frac{3}{5}$ or $x > -\frac{1}{2}$



11.

12. $x < 3$



Chapter 3

Absolute Value Equations and Inequalities

3.1 Absolute Value Equations

Solve each of the following.

1. $|2x| = 10$
2. $|3x - 7| = 8$
3. $|5x + 1| = -4$
4. $|x + 7| = 9$
5. $|8x + 16| = -24$
6. $|-x - 4| = -3$
7. $\left|\frac{1}{2}x + 2\right| = x - 3$
8. $\left|\frac{3}{4}x + 2\right| = 19$
9. $-5|-3x + 5| = -30$

3.2 Absolute Value Inequaltiies

Solve each. Graph your answers on a number line.

1. $|x - 9| < 10$
2. $|-x + 1| \geq 7$
3. $|x + 8| < -1$
4. $|6x - 18| < 42$
5. $|-2x + 1| \geq 9$
6. $|5x + 2| < 3x$
7. $|3x + 2| > 1$
8. $|2x - 1| \leq 7$
9. $|2x - 8| \leq 3x$
10. $3\left|\frac{1}{3}x + 9\right| > 27$
11. $|0.1x + 5.4| < 4.7$
12. $|2x - 5| \leq 12$
13. $|3x + 1| > -2x + 2$
14. $-5|x + 7| < -15$
15. $|-2x - 5| \geq x + 1$

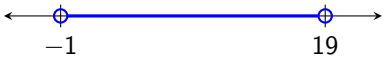
3.3 Answer Key

Absolute Value Equations

1. $x = \pm 5$
2. $x = -\frac{1}{3}$ or $x = 5$
3. $\emptyset$
4. $x = 2$ or $x = -16$
5. $\emptyset$
6. $\emptyset$
7. $x = 10$
8. $x = -28$ or $x = \frac{68}{3}$
9. $x = -\frac{1}{3}$ or $x = \frac{11}{3}$

Absolute Value Inequalities

1. $-1 < x < 19$



2. $x \leq -6$ or $x \geq 8$

3. $\emptyset$

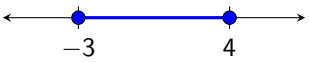
4. $-4 < x < 10$

5. $x \leq -4$ or $x \geq 5$

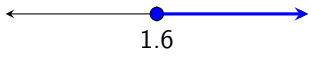
6. $\emptyset$

7. $x < -1$ or $x > \frac{1}{3}$

8. $-3 \leq x \leq 4$



9. $x \geq 1.6$



10. $x < -54$ or $x > 0$

11. $-101 < x < -7$

12. $-3.5 \leq x \leq 8.5$

13. $x < -3$ or $x > \frac{1}{5}$

14. $x < -10$ or $x > -4$

15. $x = \mathbb{R}$

Chapter 4

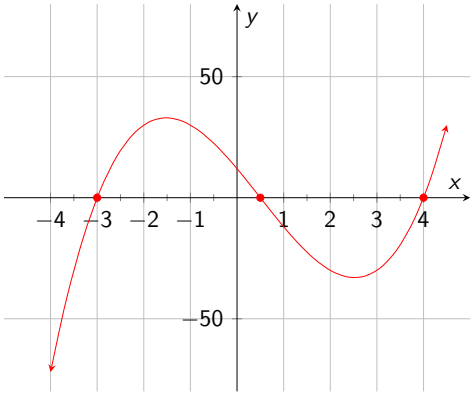
Factoring Techniques

Factor each completely.

1. $x^2 + 2x - 15$
2. $a^2 - 15a + 56$
3. $8x^2 + 10x + 3$
4. $w^2 + w - 12$
5. $5b^2 - 9b - 2$
6. $12x^2 + 40x - 7$
7. $4x^2 - 4x - 24$
8. $18t^2 - 9t - 5$
9. $6a^2 + 23a + 21$
10. $x^2 - 12x + 36$
11. $9x^2 - 1$
12. $4x^2 + 4x + 1$
13. $x^3 - x^2 - 2x$
14. $6x^2 - 32x + 10$
15. $2x^3 - 9x^2 - 51x - 40$
16. $2x^3 + 3x^2 - 3x - 2$
17. $4x^3 + 3x^2 - 42x + 40$
18. $6x^3 - 27x^2 - 168x$

The graph of a factorable expression is shown below. If the expression is in lowest terms (i.e. there is no number in front of all of the parentheses when it is factored) and contains integer coefficients, write the factored form of the expression.

19.



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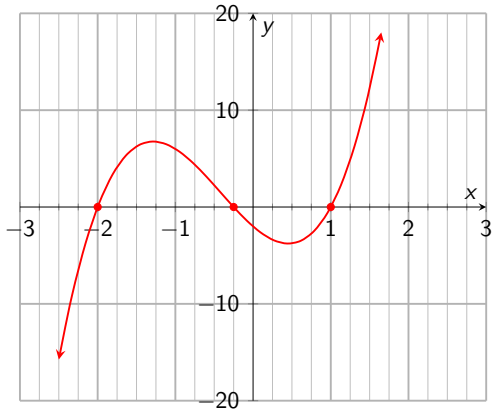

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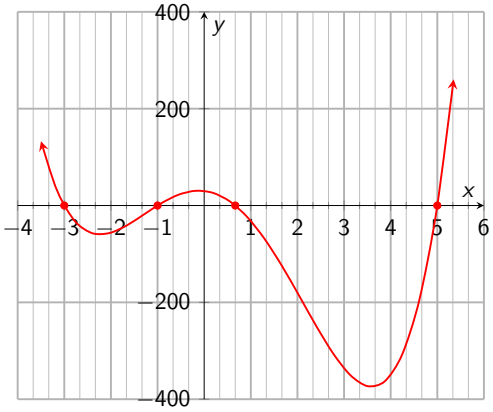


22.

4.1 Answer Key

1. $(x+5)(x-3)$
2. $(a-8)(a-7)$
3. $(4x+3)(2x+1)$
4. $(w+4)(w-3)$
5. $(b-2)(5b+1)$
6. $(2x+7)(6x-1)$
7. $4(x-3)(x+2)$
8. $(3t+1)(6t-5)$
9. $(3a+7)(2a+3)$
10. $(x-6)^2$
11. $(3x-1)(3x+1)$
12. $(2x+1)^2$
13. $x(x-2)(x+1)$
14. $2(3x-1)(x-5)$
15. $(2x+5)(x+1)(x-8)$
16. $(x+2)(2x+1)(x-1)$
17. $(x+4)(4x-5)(x-2)$
18. $3x(2x+7)(x-8)$
19. $(x+3)(2x-1)(x-4)$
20. $(x+2)(4x+1)(x-1)$
21. $(x+3)(x+1)(x-1)(x-5)$

Chapter 5

The Quadratic Formula

Solve each. Exact answers only.

1. $x^2 - 6x = -2$
2. $4x^2 + 7x - 1 = 0$
3. $8x^2 + 4x = 3$
4. $5x^2 + 6x - 2 = 3x^2 + 10$
5. $7x^2 - 5 = 6x + 11$
6. $8x^2 + 2x + 1 = 7x^2 - 8x - 9$
7. $8x^2 - 2x - 7 = 3x + 1$
8. $x^4 + 7x^2 - 5 = x^4 + 3x$
9. $-8x^2 = 3x - 14$
10. $3x^2 - 5x + 4 = 3$

5.1 Answer Key

1. $x = 3 \pm \sqrt{7}$
2. $x = \frac{-7 \pm \sqrt{65}}{8}$
3. $x = \frac{-1 \pm \sqrt{7}}{4}$
4. $x = \frac{-3 \pm \sqrt{33}}{2}$
5. $x = -\frac{8}{7}$, $x = 2$
6. $x = -5 \pm \sqrt{15}$
7. $x = \frac{5 \pm \sqrt{281}}{16}$
8. $x = \frac{3 \pm \sqrt{149}}{14}$
9. $x = \frac{-3 \pm \sqrt{457}}{16}$
10. $x = \frac{5 \pm \sqrt{13}}{6}$

Chapter 6

Complex Numbers

Simplify each.

1. $(4-7i)+(-2+6i)$
2. $(2-4i)-(2-3i)$
3. $6-(8+4i)$
4. $3(-2+7i)$
5. $(2+3i)(-2-5i)$
6. $(4+6i)(4-6i)$
7. $\frac{3+i}{2-i}$
8. $3(7-4i)+2i(1+6i)$
9. $(-2-6i)^2$
10. $\frac{2+3i}{4-5i}$
11. $(2+3i)(-5+i)$
12. $(-7-5i)^2$
13. $\frac{3+2i}{8+9i}$
14. $\frac{-1+5i}{-9-2i}$
15. $\left(\frac{2}{5}+\frac{1}{3}i\right)^2$

Solve each. Exact answers only.

16. $3x^2-7x+6=0$
17. $5x^2-3x+2=0$
18. $3x^2+7x-4=5x^2+2x+5$

6.1 Answer Key

1. $2 - i$
2. $-i$
3. $-2 - 4i$
4. $-6 + 21i$
5. $11 - 16i$
6. 52
7. $1 + i$
8. $9 - 10i$
9. $-32 + 24i$
10. $-\frac{7}{41} + \frac{22}{41}i$
11. $-13 - 13i$
12. $24 + 70i$
13. $\frac{42}{145} - \frac{11}{145}i$
14. $\frac{-1}{85} - \frac{47}{85}i$
15. $\frac{11}{225} + \frac{4}{15}i$
16. $x = \frac{7 \pm i\sqrt{23}}{6}$
17. $x = \frac{3 \pm i\sqrt{31}}{10}$
18. $x = \frac{5 \pm i\sqrt{47}}{4}$

Chapter 7

Graphs of Quadratic Expressions

Identify the vertex and axis of symmetry for each.

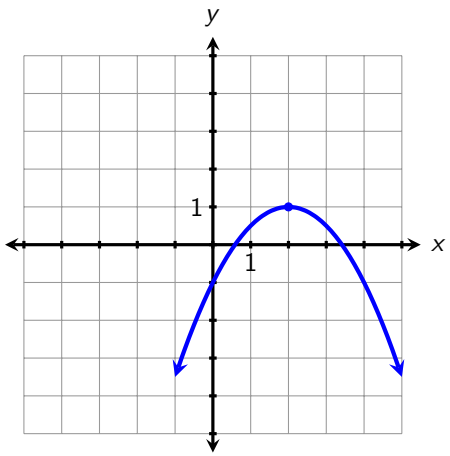
1. $y = 5x^2 - 15x + 7$
2. $y = x^2 + 8x - 1$
3. $y = \frac{1}{4}(x+3)^2 + 1$

Write each of the following in general, $y = ax^2 + bx + c$, form.

4. $y = (x-7)^2 + 4$
5. $y = -3(x+2)^2 - 5$
6. $y = \frac{1}{4}(x-7)^2 + 1$

Write each of the following in $y = a(x-h)^2 + k$ and $y = ax^2 + bx + c$ form.

7.



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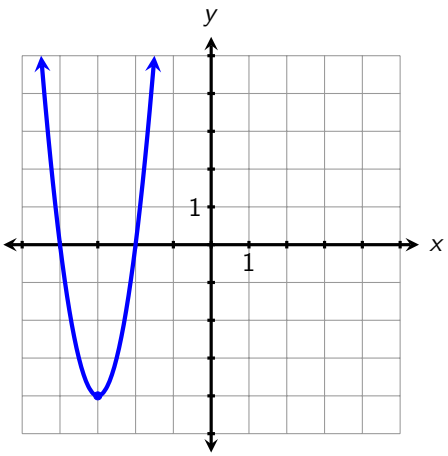

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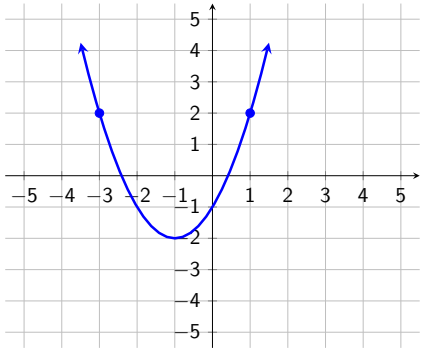

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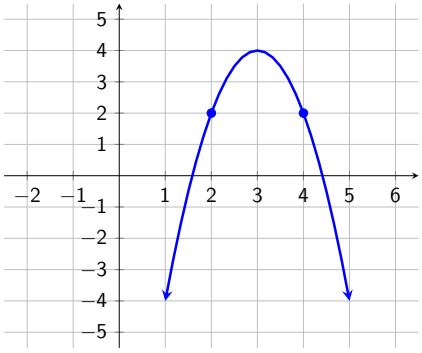


11. A football is thrown to a receiver (but, sadly, the pass was incomplete). Suppose the equation that models the trajectory of the football is

$$h = -16t^2 + 65t + 6$$

where t represents the time the football is in the air (in seconds) and h represents the height of the football (in feet).

(a) What is the maximum height of the football? Round your answer to 3 decimal places.

(b) At what time does the football reach its maximum height? Round your answer to 3 decimal places.

(c) How many seconds is the football in the air? Round your answer to 3 decimal places.

7.1 Answer Key

1. Vertex: $\left(\frac{3}{2}, -\frac{17}{4}\right)$; Axis of Symmetry: $x = \frac{3}{2}$
2. Vertex: $(-4, -17)$; Axis of Symmetry: $x = -4$
3. Vertex: $(-3, 1)$; Axis of Symmetry: $x = -3$
4. $y = x^2 - 14x + 53$
5. $y = -3x^2 - 12x - 17$
6. $y = \frac{1}{4}x^2 - \frac{7}{2}x + \frac{53}{4}$
7. $y = -\frac{1}{2}(x-2)^2 + 1 = -\frac{1}{2}x^2 + 2x - 1$
8. $y = 4(x+3)^2 - 4 = 4x^2 + 24x + 32$
9. $y = (x+1)^2 - 2 = x^2 + 2x - 1$
10. $y = -2(x-3)^2 + 4 = -2x^2 + 12x - 14$
11. (a) 72.016 feet
    (b) 2.031 seconds
    (c) 4.153 seconds

Chapter 8

Intro to Functions

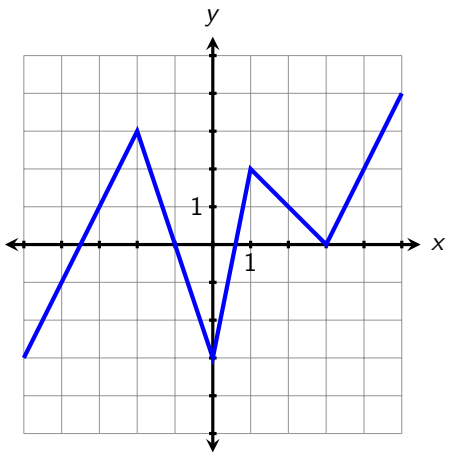
Evaluate each of the following given $f(x) = \frac{x}{5} + 8$.

1. $f(9)$
2. $f(-1)$
3. $f(8)$

Evaluate $f(x, y) = 3x^2 - \frac{32}{y}$ for each.

4. $f(5, 1)$
5. $f(-2, 2)$
6. $f(0, 8)$
7. $f(1, -1)$

Given the graph of $f(x)$ below, find each of the following.



8. $f(-5)$
9. $f(-4)$
10. $f(-1)$
11. $f(-2)$
12. $f(3)$
13. $f(4)$
14. $f(2)$
15. $f(0)$

8.1 Answer Key

1. $\frac{49}{5}$
2. $\frac{39}{5}$
3. $\frac{48}{5}$
4. 43
5. -4
6. -4
7. 35
8. -3
9. -1
10. 0
11. 3
12. 0
13. 2
14. 1
15. -3

Chapter 9

Operations with Functions

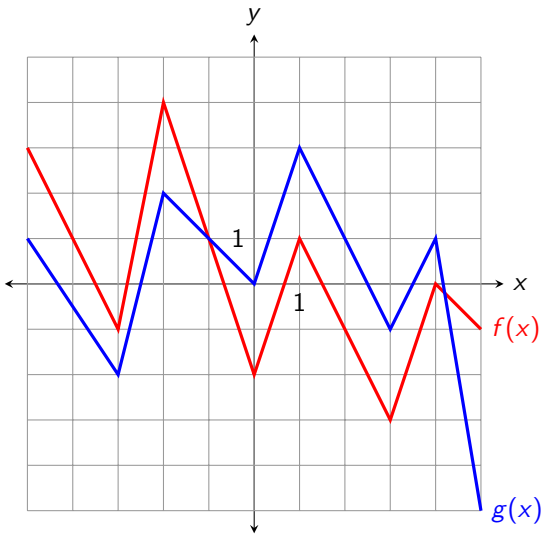
Given $f(x) = x^2 + 2x - 3$ and $g(x) = 5x + 2$, simplify or evaluate each.

1. $(f+g)(x)$
2. $(f-g)(x)$
3. $(g-f)(x)$
4. $(fg)(x)$
5. $\left(\frac{f}{g}\right)(x)$
6. $\left(\frac{g}{f}\right)(x)$
7. $(g+f)(7)$
8. $(fg)(0)$

Given $f(x) = x^2 + 5$ and $g(x) = -3x - 2$, find or evaluate each.

9. $(f+g)(x)$
10. $(fg)(x)$
11. $(f-g)(4)$
12. $\left(\frac{f}{g}\right)(7)$

Given the graph of $f(x)$ and $g(x)$, find each.



13. $(f+g)(-2)$
14. $(f-g)(1)$
15. $(fg)(3)$
16. $(g-f)(-5)$
17. $\left(\frac{f}{g}\right)(4)$
18. $\left(\frac{g}{f}\right)(-5)$

Find the value of each of the following given the table below.

x	**−4**	**−3**	**−2**	**−1**	**0**	**1**	**2**	**3**	**4**
f(x)	−1	3	1	4	−2	−4	−3	2	0
g(x)	0	−4	1	−3	−2	4	2	−1	3

19. $(f+g)(1)$
20. $(f-g)(-2)$
21. $(fg)(0)$
22. $\left(\frac{g}{f}\right)(2)$
23. $(g+g)(-3)$

9.1 Answer Key

1. $x^2 + 7x - 1$
2. $x^2 - 3x - 5$
3. $-x^2 + 3x + 5$
4. $5x^3 + 12x^2 - 11x - 6$
5. $\frac{x^2+2x+3}{5x+2}$
6. $\frac{5x+2}{x^2+2x+3}$
7. 97
8. -6
9. $x^2 - 3x + 3$
10. $-3x^3 - 2x^2 - 15x - 10$
11. 35
12. $-\frac{54}{23}$
13. 6
14. -2
15. 3
16. -2
17. 0
18. $\frac{1}{3}$
19. 0
20. 0
21. 4
22. $-\frac{2}{3}$
23. -8

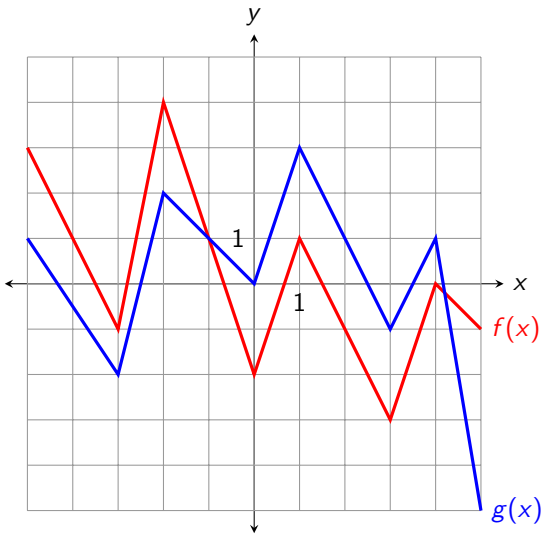
Chapter 10

Compositions of Functions

Given $f(x) = x^2 + 5$ and $g(x) = -3x - 2$, find or evaluate each.

1. $(f \circ g)(x)$
2. $(g \circ f)(x)$
3. $(f \circ f)(x)$
4. $g(g(x))$
5. $(f \circ g)(1)$
6. $(g \circ f)(-2)$
7. $(f \circ f)(0)$
8. $g(g(-8))$

Given the graph of $f(x)$ and $g(x)$, find each.



9. $(f \circ g)(0)$
10. $(g \circ f)(-5)$
11. $(f \circ f)(1)$
12. $(g(g(5))$

Find the value of each of the following given the table below.

x	**−4**	**−3**	**−2**	**−1**	**0**	**1**	**2**	**3**	**4**
f(x)	−1	3	1	4	−2	−4	−3	2	0
g(x)	0	−4	1	−3	−2	4	2	−1	3

13. $(f \circ g)(1)$
14. $(g \circ f)(3)$
15. $(f \circ f)(0)$
16. $g(g(4))$
17. $f(g(-1))$

Answer Key

1. $9x^2 + 12x + 9$
2. $-3x^2 - 17$
3. $x^4 + 10x^2 + 30$
4. $9x + 4$
5. 30
6. -29
7. 30
8. -68
9. -2
10. -1
11. 1
12. 1
13. 0
14. 2
15. 1
16. -1
17. 3

Chapter 11

Function Transformations

For the function $f(x) = \sqrt{x}$, write the resulting function $g(x)$ after the final ordered sequence of transformations.

1. (1) Shift up 3 units
   (2) Shift right 2 units

2. (1) Shift left 3 units
   (2) Reflect across x-axis

3. (1) Vertical compression by factor of 3
   (2) Reflect across y-axis

4. (1) Vertical stretch by factor of 4
   (2) Shift down 7 units

For each, determine the parent function, $f(x)$, and list all transformations done to it. Be specific.

5. $g(x) = 3(-x + 1)^3$

6. $g(x) = -\frac{2}{3}\sqrt{x - 4}$

7. $g(x) = |x + 7| - 5$

11.1 Answer Key

1. $g(x) = \sqrt{x-2} + 3$
2. $g(x) = -\sqrt{x+3}$
3. $g(x) = \frac{1}{3}\sqrt{-x}$
4. $g(x) = 4\sqrt{x} - 7$
5. Parent: $f(x) = x^3$
   - Shift left 1 unit
   - Reflect across y-axis
   - Vertical stretch by factor of 3
6. Parent: $f(x) = \sqrt{x}$
   - Shift right 4 units
   - Reflect across x-axis
   - Vertical compression by factor $\frac{3}{2}$
7. Parent: $f(x) = |x|$
   - Shift left 7 units
   - Shift down 5 units

Chapter 12

Domain and Range

State the domain and range of each.

1. $f(x) = -\frac{1}{4}x - \frac{3}{7}$
2. $g(x) = \frac{1}{4+x}$
3. $h(x) = \sqrt{2x+5} - 1$

12.1 Answer Key

1. Domain: $\mathbb{R}$ Range: $\mathbb{R}$
2. Domain: $x \neq -4$ Range: $y \neq 0$
3. Domain: $x \geq -\frac{5}{2}$ Range: $y \geq -1$

Chapter 13

Inverse Functions

Find the inverse of each function. Then find the domain and range of *both* the given function and its inverse.

1. $f(x) = \frac{-3}{x-4}$
2. $g(x) = \sqrt{2x+7} - 1$
3. $h(x) = \sqrt[3]{x+10} + 6$

13.1 Answer Key

1. $f^{-1}(x) = \frac{-3}{x} + 4$

	Domain	Range
$f(x)$	$x \neq 4$	$y \neq 0$
$f^{-1}(x)$	$x \neq 0$	$y \neq 4$

2. $g^{-1}(x) = \frac{1}{2}(x+1)^2 - \frac{7}{2}$

	Domain	Range
$g(x)$	$x \geq -3.5$	$y \geq -1$
$g^{-1}(x)$	$x \geq -1$	$y \geq -3.5$

3. $h^{-1}(x) = (x-6)^3 - 10$

	Domain	Range
$f(x)$	$\mathbb{R}$	$\mathbb{R}$
$f^{-1}(x)$	$\mathbb{R}$	$\mathbb{R}$

Chapter 14

Intro to Vectors and Matrices

Given $\vec{a} = \begin{bmatrix} -2 \\ 1 \end{bmatrix}$ and $\vec{b} = \begin{bmatrix} 3 \\ 0 \end{bmatrix}$, find and sketch the result of each.

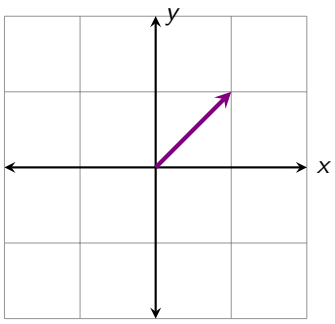
1. $\vec{a} + \vec{b}$
2. $\vec{a} - \vec{b}$
3. $2\vec{a}$
4. $3\vec{b}$
5. $2\vec{a} + 3\vec{b}$

Given $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, graph and determine the effect on A after each multiplication.

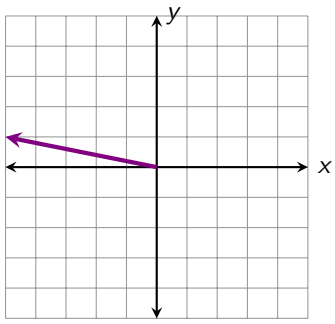
6. $\begin{bmatrix} 2.5 & 0 \\ 0 & 2.5 \end{bmatrix} A$
7. $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} A$
8. $\begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix} A$
9. $\begin{bmatrix} 3 & -3 \\ 3 & 3 \end{bmatrix} A$

14.1 Answer Key

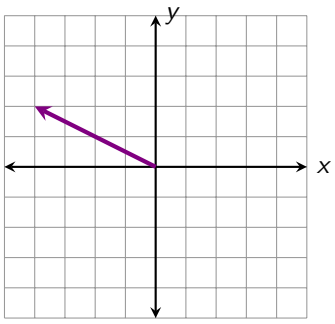
1. $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$



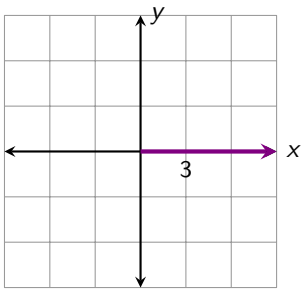
2. $\begin{bmatrix} -5 \\ 1 \end{bmatrix}$



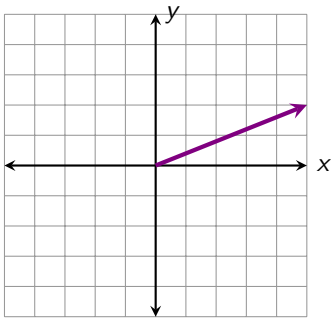
3. $\begin{bmatrix} -4 \\ 2 \end{bmatrix}$



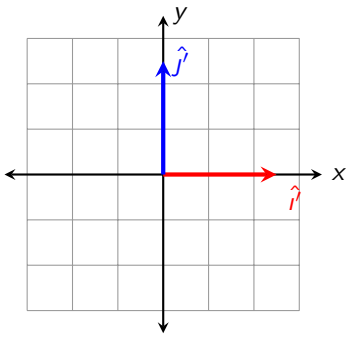
4. $\begin{bmatrix} 9 \\ 0 \end{bmatrix}$



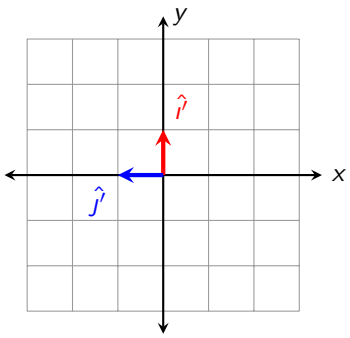
5. $\begin{bmatrix} 5 \\ 2 \end{bmatrix}$



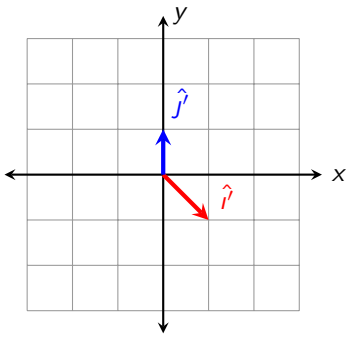
6. Scales $\hat{\imath}$ and $\hat{\jmath}$ each by 2.5



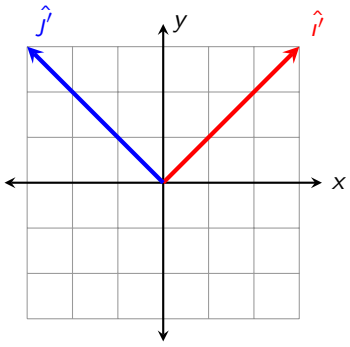
7. Rotate 90° counterclockwise.



8. Shears $\hat{\imath}$



9. Scales $\hat{\imath}$ and $\hat{\jmath}$ by 3; rotate 45° counterclockwise.


$\hat{j}'$
y
$\hat{i}'$
x