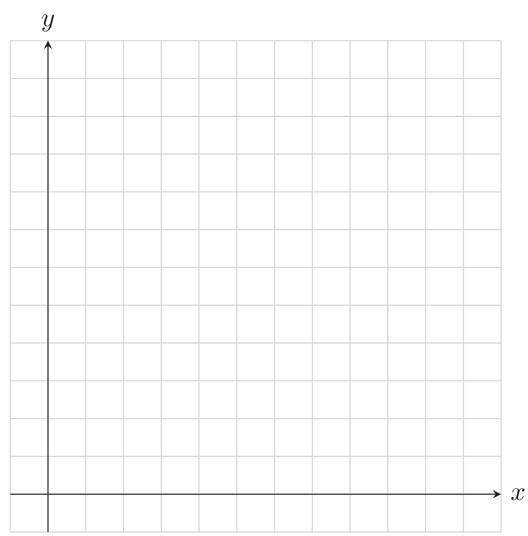
SUPPLEMENT TO §4.1

1. Solve the following systems of equations by graphing. You will need to set up different scales on the different coordinate planes to get the graphs to fit nicely. Remember you may use a different scale on the x-axis than the y-axis if it seems to be convenient. Please do this in a way that allows you to graph the lines without estimating. State your conclusion using set notation in a complete sentence.

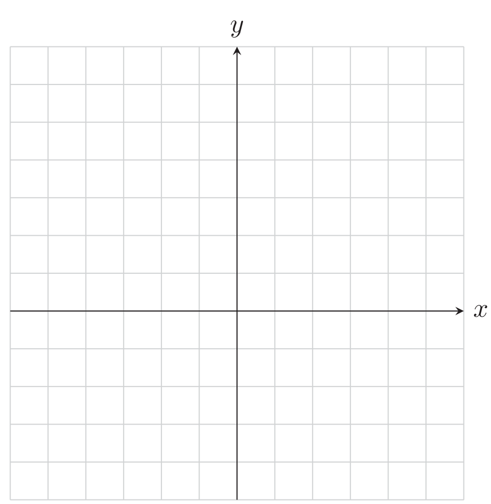
a.

$$\begin{cases} y &= -\frac{3}{20}x + 7 \\ 5y &= x \end{cases}$$



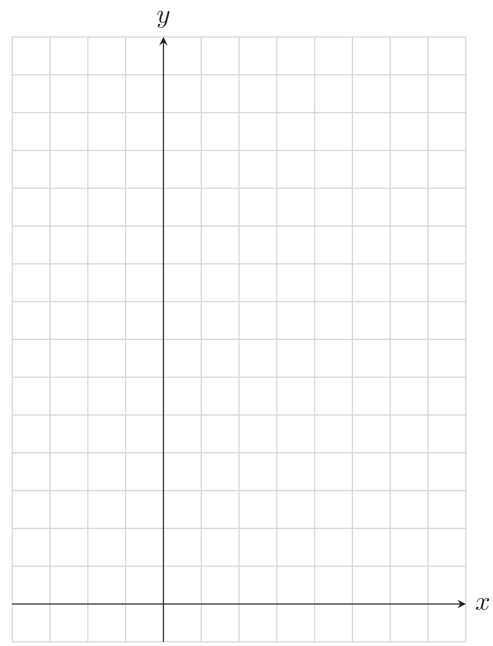
b.

$$\begin{cases} y &= 20x - 40 \\ y &= 60 - 30x \end{cases}$$



c.

$$\begin{cases} 20x + y &= 70 \\ y &= -5x + 40 \end{cases}$$



SUPPLEMENT TO §4.4

1. Hugo Reyes was mixing dried mango slices with dried pineapple to create a delightful island mix. The mango costs \$5.99 per pound and the pineapple costs \$3.99 per pound.

    a. Is it possible for Hugo to mix the fruit in such a way to create a mix that costs a total of \$1.99 per pound?

    b. If Hugo mixed the fruit and calculated that his mix would cost \$4.80 per pound, which ingredient did he add more of?

    c. If Hugo mixed the fruit and calculated that his mix would cost \$5.00 per pound, which ingredient did he add more of?

    d. If Hugo had a 5 pound bag of fruit that he said was worth \$5.99 per pound, how much of each fruit did he add to make it?

2. Convert the following values as requested by using dimensional analysis.

   a. Write 36 minutes in hours as a decimal.

   b. Write 54 minutes in hours as a fraction.

   c. Write 4 hours and 20 minutes in minutes.

   d. Write 4.2 hours as hours and minutes.

   e. Find the number of feet (round to the nearest thousandth) in 248 centimeters [2.54 cm = 1 inch; 12 inches = 1 foot].

   f. Find the number of square inches in 4 square feet.

   g. Find the number of square feet in 343 square inches. Round your answer to the nearest thousandth.

SUPPLEMENT TO §5.2

1. Let the functions f and g be defined by

$$f(x) = x^2 + \frac{1}{3}x + \frac{4}{5} \text{ and } g(h) = \left(h - \frac{3}{4}\right)(h + 8).$$

Evaluate and simplify the following expressions.

a. $f(-3)$

b. $g\left(-\frac{5}{4}\right)$

SUPPLEMENT TO §6.6

1. Determine whether the equation/function is linear, quadratic, or another kind of equation/function.

a. $5x^2 + 2y = 2$

b. $5x + 2y = 2x$

c. $y = \sqrt{2}x + 1$

d. $f(x) = x$

e. $x = -1$

f. $\pi x\sqrt{7}y = 3^2$

g. $y = 4(x-1) + 2(x-3)$

h. $y = \dfrac{3}{x} + 4x$

i. $h(r) = r^3 + r^2$

j. $g(x) = (x-1)(x+5)$

k. $y = \dfrac{4}{5}$

l. $A(r) = \pi r^2$

SUPPLEMENT TO §7.1

If we want to estimate $\sqrt{10}$, we need to find the nearest integers below and above the 10 that are perfect squares (so the square root can be found). The nearest perfect square integers to 10 are 9 and 16. So, since 10 is between 9 and 16 (i.e., $9 < 10 < 16$) we know that $\sqrt{10}$ will be between $\sqrt{9}$ and $\sqrt{16}$ (i.e., $\sqrt{9} < \sqrt{10} < \sqrt{16}$). Since we can simplify $\sqrt{9}$ and the $\sqrt{16}$ to 3 and 4 respectively it must be that $\sqrt{10}$ is between 3 and 4 (i.e., $3 < \sqrt{10} < 4$).

1. Use your calculator to estimate $\sqrt{10}$. Is it in fact between 3 and 4?

2. Fill-in the blanks with integers. Verify using your calculator.

   a. $\sqrt{19}$: Since _______ $< 19 <$ _______ , we know that _______ $< \sqrt{19} <$ _______ . Without a calculator, I estimate that $\sqrt{19} \approx$ _______ .

   b. $\sqrt{3.2}$: Since _______ $< 3.2 <$ _______ , we know that _______ $< \sqrt{3.2} <$ _______ . Without a calculator, I estimate that $\sqrt{3.2} \approx$ _______ .

SUPPLEMENT TO §7.4

1. A student correctly solved an equation and ended up with the solution $\frac{30}{\sqrt{12}}$. However, the answer in the back of the book is $5\sqrt{3}$.

   a. Round both numbers to the nearest tenth using your calculator.

   b. Show how these answers are the same algebraically.

2. Solve the equation $\sqrt{3} \cdot x + 4 = 10$ algebraically. Rationalize the denominator of your solution.

SUPPLEMENT TO §8.1

1. Solve the equations below using the square root property, if possible. If not possible, use factoring. State a conclusion using set notation in a complete sentence.

   a. $3x^2 = 48$

   b. $(x-3)^2 = 4x$

   c. $3x^2 - 5 = -14x$

   d. $3(2x-4)^2 - 4 = 20$

2. The stopping distance of a car is proportional to the square of its speed before slamming on the brakes. That means that the function

$$D(v) = kv^2$$

gives the stopping distance, D, in feet, where v is the speed of the car before braking, in miles per hour. Further, k is a number that depends on how good the tires are and the road conditions. For a car with good tires on a good road, $k \approx 0.05$, so

$$D(v) = 0.05v^2.$$

a. Find $D(60)$ and interpret your answer.

b. Find $D(70)$ and interpret your answer.

c. Using your answers above, what is the ratio $\dfrac{D(70)}{D(60)}$ and what does it mean in context of the story?

d. A neighbor's basketball rolls out into the road 30 feet in front of you. There is no room to swerve to avoid it! What is the maximum speed you could be going and still not hit the ball if you slam on the brakes?

Recall that, given a right triangle with interior angle θ as shown in Figure 1,

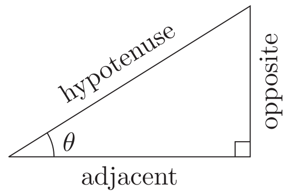
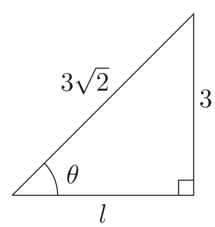


Figure 1

the trigonometric functions sine, cosine, and tangent are defined as follows:

$$\sin(\theta) = \frac{\text{opp}}{\text{hyp}},\ \cos(\theta) = \frac{\text{adj}}{\text{hyp}},\ \text{and}\ \tan(\theta) = \frac{\text{opp}}{\text{adj}}.$$

EXAMPLE: Find the output of sine, cosine, and tangent for the angle θ shown.



Solutions: We can use the Pythagorean Theorem to find the length of the side adjacent to θ:

$$\begin{aligned} 3^2 + l^2 &= \left(3\sqrt{2}\right)^2 \\ 9 + l^2 &= 9 \cdot 2 \\ 9 + l^2 &= 18 \\ l^2 &= 9 \\ l &= \pm\sqrt{9} \\ l &= \pm 3 \end{aligned}$$

Since l represents a length, we choose the positive value, so $l = 3$. We now use opp$= 3$, adj$= 3$, and hyp$= 3\sqrt{2}$ to evaluate the sine, cosine, and tangent of θ:

$$\begin{aligned} \sin(\theta) &= \frac{\text{opp}}{\text{hyp}} \\ &= \frac{3}{3\sqrt{2}} \\ &= \frac{1}{\sqrt{2}} \\ &= \frac{1}{\sqrt{s}} \cdot \frac{\sqrt{2}}{\sqrt{2}} \\ &= \frac{\sqrt{2}}{2} \end{aligned}$$

$$\begin{aligned} \cos(\theta) &= \frac{\text{adj}}{\text{hyp}} \\ &= \frac{3}{3\sqrt{2}} \\ &= \frac{1}{\sqrt{2}} \\ &= \frac{1}{\sqrt{s}} \cdot \frac{\sqrt{2}}{\sqrt{2}} \\ &= \frac{\sqrt{2}}{2} \end{aligned}$$

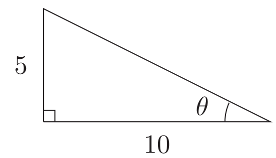
$$\begin{aligned} \tan(\theta) &= \frac{\text{opp}}{\text{adj}} \\ &= \frac{3}{3} \\ &= 1 \end{aligned}$$

■

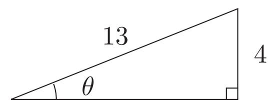
EXERCISES:

3. Find the outputs of the sine, cosine, and tangent functions given the angle θ from the given figure.

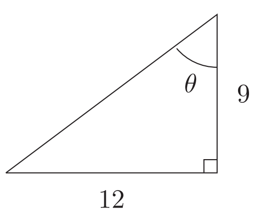
a.



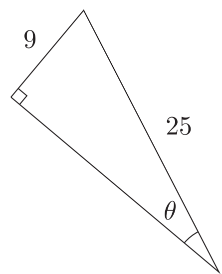
d.



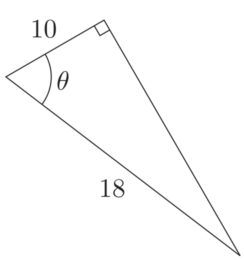
b.



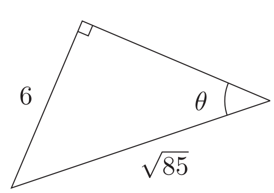
e.



c.



f.



SUPPLEMENT TO §8.3

1. First, identify the following as being a linear equation, linear expression, quadratic equation, or quadratic expression. Then do one of the following, as appropriate for the given situation.

    i. If you have a linear equation, solve it for x and then state a conclusion using set notation in a complete sentence. Check your solution in the original equation.

    ii. If you have a linear expression, simplify it.

    iii. If you have a quadratic equation, solve it for x using the easiest method and then state a conclusion using set notation in a complete sentence. Check your solution(s) in the original equation.

    iv. If you have a quadratic expression, simplify it and factor if possible.

    a. $\dfrac{3}{2}x + \dfrac{4}{5} = \dfrac{3}{10}$

    b. $2(2x - 2)^2 - 10 = 26$

    c. $3x^2 + 11x - 4$

    d. $(x - 4)^2 = x$

2. Let functions f and g be defined as follows:

$$f(x) = (x+6)^2 \text{ and } g(x) = -(10x+1)(x-3).$$

Find the missing coordinates in the following tables. Note that there may be 2 inputs for some outputs. Approximate any irrational numbers to the nearest tenth. If there is no real number that works, indicate this.

x	$y = f(x)$
-2	
0	
	0
	-2
	9
$\frac{1}{3}$	

x	$y = g(x)$
-1	
$-\frac{4}{5}$	
	0
	24
3.5	
	33

3. Let the functions f, g, and h be defined as follows:

$$f(x) = x^2 - 1,\ g(x) = 3x - 1, \text{ and } h(x) = 2x - 6.$$

Use these to answer the following.

a. Find $f(-4)$.

b. Is the "-4" in $f(-4)$ an input or an output?

c. Is "$f(-4)$" an input or an output?

d. If $h(3) = 0$, what point do you know is on the graph of $y = h(x)$?

e. If $f(-3) = 8$, what point do you know is on the graph of $y = f(x)$?

f. Determine which function must have the point (2,3) on its graph.

g. Determine which function must have the point $(-2, -7)$ on its graph.

h. Solve $g(x) = 7$. State a conclusion using set notation in a complete sentence.

i. Solve $h(x) = 0$. State a conclusion using set notation in a complete sentence.

j. Solve $f(x) = 8$. State a conclusion using set notation in a complete sentence.

k. Fix and explain what is wrong with the underlined part of each of the following.

   i. $\underline{f(x)} = (3)^2 - 1$

   ii. $g(2) = \underline{3x - 1}$

   iii. $h(a) = \underline{2x - 6}$

SUPPLEMENT TO §8.5

1. Use the graphs of the equations

$$y = 2x + 1 \text{ and } y = x^2 + 3x + 2$$

given below to answer the following questions.

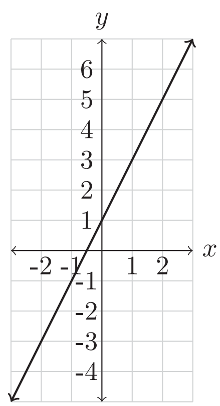


Figure 1: $y = 2x + 1$

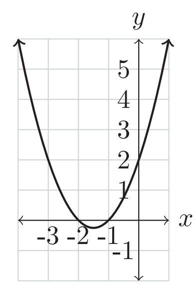


Figure 2: $y = x^2 + 3x + 2$

a. What do the points on the graph in Figure 1 represent in regards to the equation $y = 2x + 1$?

b. What do the points on the graph in Figure 2 represent in regards to the equation $y = x^2 + 3x + 2$?

2. If the graph of a function f given by $y = f(x)$ is symmetric about the line $x = 5$ and the point $(1, -9)$ is on the graph, what other point must be on the graph of f? Explain your reasoning.

3. If the graph of a quadratic function g given by $y = g(x)$ has the points $(-3, 6)$ and $(7, 6)$ on it, what is the x-value of the vertex? Explain your reasoning.

4. For the function

$$R(x) = x^2 + 4x + 21$$

answer the following questions.

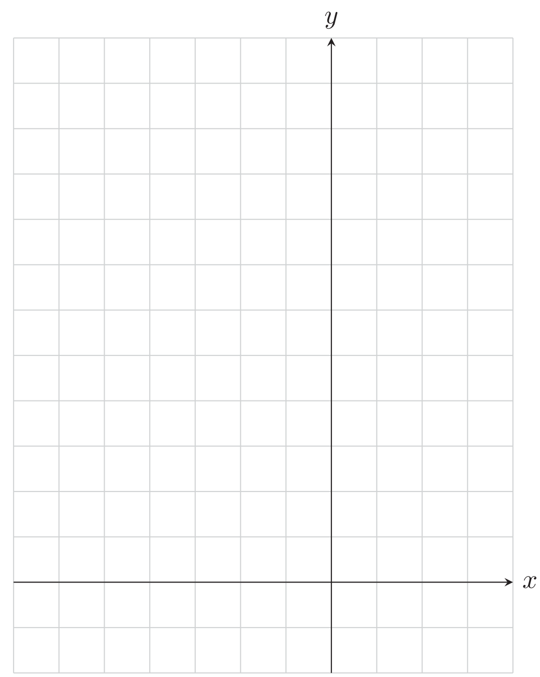
a. What is the vertical intercept? Show your work using function notation.

b. Find the horizontal intercepts.

c. What is the vertex?

d. What is the axis of symmetry?

e. Based on the information from parts (a) - (d), draw a complete graph of $y = R(x)$. You will need to assign an appropriate scale for the graph to fit properly.



f. State the domain and range of the function R using interval notation.

5. If a parabola has vertex $(-6, 17)$, use the information given and symmetry to fill in the missing values in the following table.

x	-2		2	
y	18	18	21	21

6. An artist, Michael, sells 100 prints over one year for \$10 each. Michael, who is an amateur mathematician and statistician, did some research and found out that for each price increase of \$2 per print, the sales drop by 5 prints per year. The revenue, R, from selling the prints is given by

$$R(x) = (100 - 5x)(2x + 10)$$

where $100 - 5x$ is the number of prints sold, $2x + 10$ is the cost of each print, and x is the number of \$2 price increases he has done.

a. At what price should Michael sell his prints to maximize the revenue? How many prints will he sell at this price?

b. Find the horizontal intercepts of $y = R(x)$ and interpret their meaning in the context of the problem.

7. During an infrequent rainstorm, the L.A. River collects all the runoff rainwater from the storm and channels it out to sea. The depth of water in the L.A. River, D, in feet, is a function of the time t, in hours, since the storm ended. The function is given by $D(t) = -t^2 + 2t + 8$.

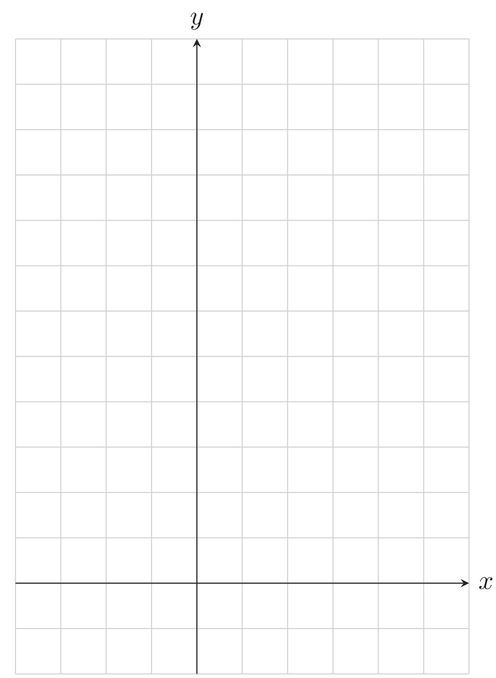
a. Evaluate and interpret $D(3)$.

b. Find and interpret the vertical-intercept.

c. Find and interpret the horizontal-intercepts.

d. At what time will the water be deepest? What is that maximum depth?

e. Graph $y = D(t)$ on its domain.



f. Realistically, what is the range of D and what does it mean?

8. A trebuchet is a French catapult originally used to launch large projectiles long distances. North of England a man named Hew Kennedy built a full-size one to hurl random objects. Seriously, look it up online after you finish this homework. It's pretty fantastic. Suppose that the height of a piano off the ground, h, in feet, is a function of the horizontal distance along the ground in the direction it is thrown, x, also in feet. Given that $h = f(x) = -0.002x^2 + 0.6x + 60$, answer the following questions.

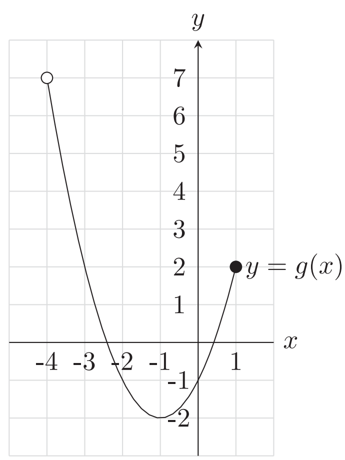
    a. Find the vertex. Explain what the vertex means in context of the situation.

    b. If I want to crush a Volkswagen bug with the piano, how far from the trebuchet should I park it?

SUPPLEMENT TO §8.6

1. Functions f, g, and h are defined below. Use them to answer the given questions.

$f(x) = 3x - 7$



x	$y = h(x)$
-7	-3
0	64
1	64
3	-4
5	0
10	3

a. Evaluate $f(-3)$

b. Evaluate $g(0)$

c. Solve $f(x) = 11$

d. Evaluate $g(-3)$

e. Evaluate $h(3)$

f. If $g(x) = 2$, then what does x have to equal?

g. Evaluate $h(-7)$

h. Evaluate $h(-3)$

i. If $h(x) = 0$, then what does x have to equal?

j. State the domain of g.

k. State the range of g.

l. State the domain of h.

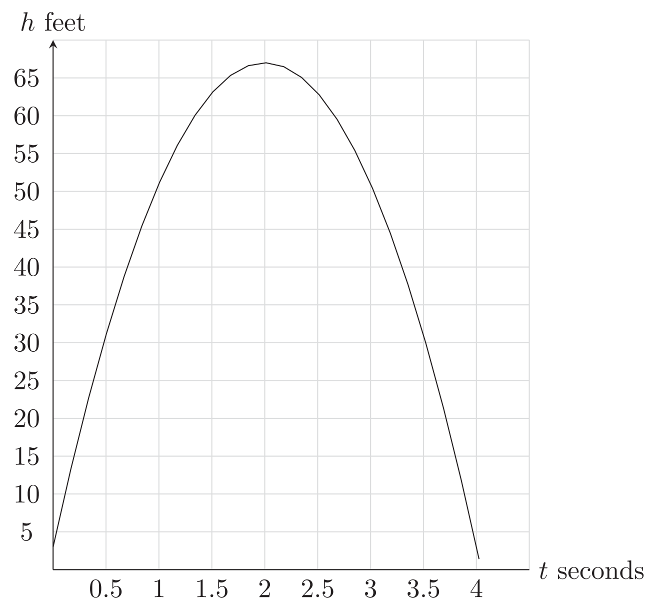
m. State the range of h.

2. A company's profit can be modeled by the function $P(t) = t^2 - 6t + 17$ which outputs the profit (in thousands of dollars) given a number of years, t, since 2005.

   a. Find and interpret $P(3)$.

   b. Find and interpret $P(0)$.

3. A baseball batter hits a ball into the air. The height (in feet) of the baseball t seconds after the batter hits the ball is given by the function f in the following graph. Use the graph to answer the following questions.



   a. Estimate $f(3)$ and interpret.

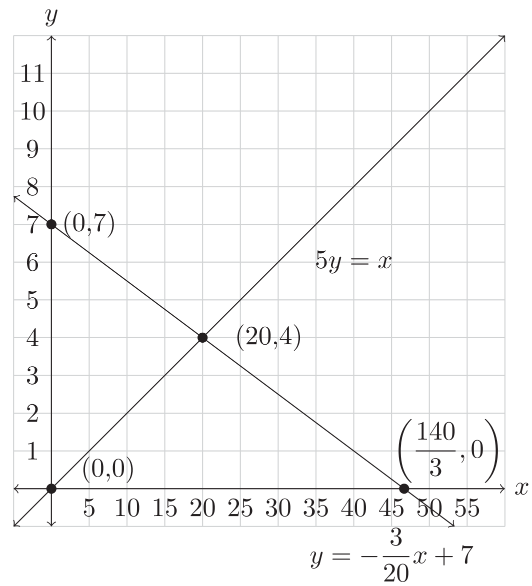
   b. If $f(t) = 20$, then $t \approx$ ______________ .
   Interpret.

   c. When will the ball be at a height of 50 feet?

   d. What are the domain and range of this function? Interpret each based on this application.

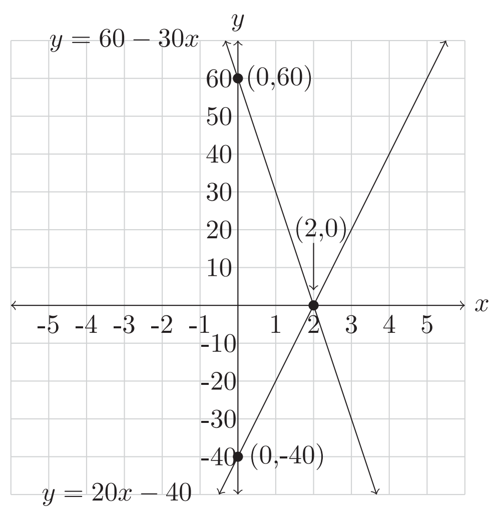
ANSWERS TO SUPPLEMENT §4.1**:**

1. a.



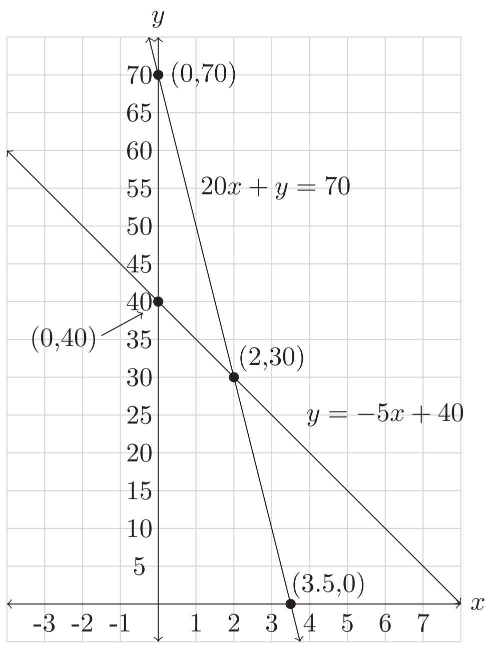
The solutions set is $\{(20, 4)\}$.

b.



The solution set is $\{(2, 0)\}$.

c.



The solution set is $\{(2, 30)\}$.

ANSWERS TO SUPPLEMENT §4.4**:**

1. a. No, it's not possible. The cheapest mix he could possibly make is made entirely of pineapple and would cost \$3.99 per pound. Even if you add a tiny amount of mango, it would raise the price.

   b. The cost of \$4.80 per pound is closer to \$3.99 than \$5.99. This means that more of the pineapple was added than mango.

   c. The cost of \$5.00 per pound is closer to \$5.99 than \$3.99. This means he added more mango than pineapple.

   d. He added 5 pounds of mango and no pineapple at all.

2. a. 36 minutes equals 0.6 hour.

   b. 54 minutes equals $\frac{9}{10}$ hour.

   c. 4 hours and 20 minutes equals 260 minutes.

   d. 4.2 hours equals 4 hours and 12 minutes.

   e. 248 centimeters is approximately 8.136 feet.

   f. 4 square feet equals 576 square inches.

   g. 343 square inches is approximately 2.382 square feet.

ANSWERS TO SUPPLEMENT §5.2**:**

1. a. $f(-3) = \dfrac{44}{5}$ b. $g\left(-\dfrac{5}{4}\right) = -\dfrac{27}{2}$

ANSWERS TO SUPPLEMENT §6.6**:**

1.
   a. This is a quadratic equation.
   b. This is a linear equation.
   c. This is a linear equation.
   d. This is a linear function.
   e. This is a linear equation.
   f. This is neither a linear nor a quadratic equation.
   g. This is a linear equation.
   h. This is neither a linear nor a quadratic equation.
   i. This is neither a linear nor a quadratic function.
   j. This is a quadratic function.
   k. This is a linear equation.
   l. This is a quadratic function.

ANSWERS TO SUPPLEMENT §7.1**:**

1. $\sqrt{10} \approx 3.16$. Yes it is in fact between 3 and 4.

2. a. Since $16 < 19 < 25$, we know that $\sqrt{16} < \sqrt{19} < \sqrt{25}$. Without a calculator, I estimate that $\sqrt{19} \approx 4.2$.

   b. Since $1 < 3.2 < 4$, we know that $\sqrt{1} < \sqrt{3.2} < \sqrt{4}$. Without a calculator, I estimate that $\sqrt{3.2} \approx 1.8$.

ANSWERS TO SUPPLEMENT §7.4**:**

1. a.
$$\frac{30}{\sqrt{12}} \approx 8.7$$
$$5\sqrt{3} \approx 8.7$$

b.
$$\begin{aligned}\frac{30}{\sqrt{12}} &= \frac{30}{\sqrt{4\cdot 3}}\\ &= \frac{30}{2\sqrt{3}}\\ &= \frac{30}{2\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}}\\ &= \frac{30\sqrt{3}}{2\cdot 3}\\ &= \frac{30\sqrt{3}}{6}\\ &= 5\sqrt{3}\end{aligned}$$

2. The solution set is $\{2\sqrt{3}\}$.

ANSWERS TO SUPPLEMENT §8.1**:**

1. a. The solution set is $\{-4, 4\}$.

   b. The solution set is $\{1, 9\}$.

   c. The solution set is $\left\{\frac{1}{3}, -5\right\}$.

   d. The solution set is $\{2-\sqrt{2}, 2+\sqrt{2}\}$.

2. a. $D(60) = 180$. This means that a car going 60 miles per hour will take approximately 180 feet to stop if the brakes are slammed.

   b. $D(70) = 245$. This means that a car going 70 miles per hour will take approximately 245 feet to stop if the brakes are slammed.

   c. The ratio $\frac{D(70)}{D(60)} = \frac{49}{36}$ which means that your stopping distance is seven-fifths longer when you drive 70 miles per hour than when you drive 60 miles per hour.

   d. The maximum speed you can be driving to be able to still stop in 30 feet is $10\sqrt{6}$ or approximately 24.5 miles per hour.

3. a. $\sin(\theta) = \frac{\sqrt{5}}{5}$, $\cos(\theta) = \frac{2\sqrt{5}}{5}$, $\tan(\theta) = \frac{1}{2}$

   b. $\sin(\theta) = \frac{4}{5}$, $\cos(\theta) = \frac{3}{5}$, $\tan(\theta) = \frac{4}{3}$

   c. $\sin(\theta) = \frac{2\sqrt{14}}{9}$, $\cos(\theta) = \frac{5}{9}$, $\tan(\theta) = \frac{2\sqrt{14}}{5}$

   d. $\sin(\theta) = \frac{4}{13}$, $\cos(\theta) = \frac{3\sqrt{17}}{13}$, $\tan(\theta) = \frac{4\sqrt{17}}{51}$

   e. $\sin(\theta) = \frac{9}{25}$, $\cos(\theta) = \frac{4\sqrt{34}}{25}$, $\tan(\theta) = \frac{9\sqrt{34}}{136}$

   f. $\sin(\theta) = \frac{6\sqrt{85}}{85}$, $\cos(\theta) = \frac{7\sqrt{85}}{85}$, $\tan(\theta) = \frac{6}{7}$

ANSWERS TO SUPPLEMENT §8.3:

1. a. This is a linear equation. The solution set is $\left\{-\frac{1}{3}\right\}$.

   b. This is a quadratic expression. The solution set is $\left\{1+\frac{3}{2}\sqrt{2}, 1-\frac{3}{2}\sqrt{2}\right\}$.

   c. This is a quadratic expression. $3x^2+11x-4=(3x-1)(x+4)$

   d. This is a quadratic equation. The solution set is $\left\{\frac{9+\sqrt{17}}{2}, \frac{9-\sqrt{17}}{2}\right\}$.

2.

x	$y=f(x)$
-2	16
0	36
-6	0
Non-Real	-2
-9, -3	9
$\frac{1}{3}$	$\frac{361}{9}$

x	$y=g(x)$
-1	-36
$-\frac{4}{5}$	$-\frac{133}{5}$
$-\frac{1}{10}$, 3	0
$\frac{7}{5}$, $\frac{3}{2}$	24
3.5	-18
Non-Real	33

3. a. $f(-4)=15$

   b. The -4 is an input.

   c. $f(-4)$ is an output.

   d. The point $(3,0)$ is on the graph of $y=h(x)$.

   e. The point $(-3,8)$ is on the graph of $y=f(x)$.

   f. The graph of $y=f(x)$ has the point $(2,3)$ on it.

   g. The graph of $y=g(x)$ has the point $(-2,-7)$ on it.

   h. The solution set is $\left\{\frac{8}{3}\right\}$.

   i. The solution set is $\{3\}$.

   j. The solution set is $\{-3,3\}$.

   k. i. You should write $f(3)=(3)^2-1$ to show that $(3)^2-1$ is the output of f *when you input 3* into the function f.

      ii. When you input 2 into the function g you need to show that you've done so in the expression as well. That is, write $g(2)=3(2)-1$.

      iii. When you input a into the function h you need to show that you've done so in the expression as well. That is, write $h(a)=2(a)-6$.

ANSWERS TO SUPPLEMENT §8.5:

1. a. The points on the graph in Figure 1 represent the solutions to the equation $y = 2x + 1$.

   b. The points on the graph in Figure 2 represent the solutions to the equation $y = x^2 + 3x + 2$.

2. If the graph of a function is symmetric about the line $x = 5$ and the point $(1, -9)$ is on the graph then the point $(9, -9)$ must also be on the graph since $(1, -9)$ is 4 units from the axis of symmetry so you need to go another 4 units to the right of the axis of symmetry to find the point which is a reflection of $(1, -9)$ across the line $x = 5$.

3. If the graph of a quadratic function has the points $(-3, 6)$ and $(7, 6)$ on it, then the axis of symmetry must be exactly halfway between these two points since they share the same y-value. Thus the x-value of the axis of symmetry is 2. Since the axis of symmetry is a vertical line through the vertex, it follows that the x-value of the vertex is 2.

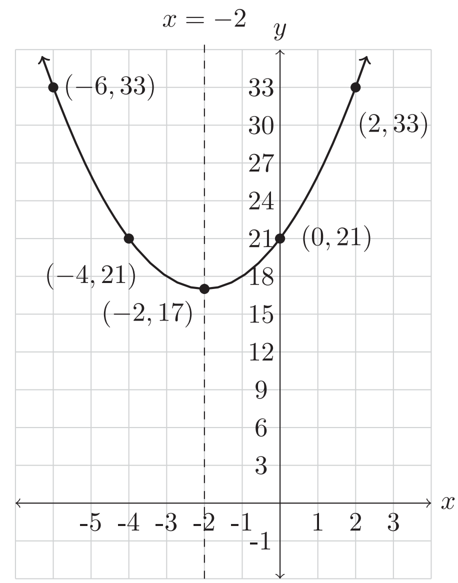
4. a. $R(0) = (0)^2 + 4(0) + 21$
   $= 21$
   Thus the vertical intercept is $(0, 21)$.

   b. There are no horizontal intercepts because the equation $x^2 + 4x + 21 = 0$ has no real solutions.

   c. The vertex is $(-2, 17)$.

   d. The axis of symmetry is $x = -2$.

   e.



$y = R(x)$

   f. The domain is $(-\infty, \infty)$ and the range is $[17, \infty)$.

5.

x	-2	-10	2	-14
y	18	18	21	21

6. a. The vertex of the parabola is $(7.5, 1562.50)$ so the revenue can reach a maximum of \$1562.50 when Michael makes 7.5 \$2 price increases. This means that the cost of of each print will be \$25 (evaluate $2x + 10$ with $x = 7.5$) and he will need to sell 62.5 prints per year (evaluate $100 - 5x$ with $x = 7.5$). Since it is not possible to sell a half of a print, Michael won't be able to earn the maximum possible revenue in one year, but he can aim to sell an average of 62.5 prints per year over several years. Let's take a look at what happens if he sells 62 prints or 63 prints per year:

   If Michael sells 62 prints per year, the revenue is given by $R(7.6)$ where 7.6 is found by solving $100 - 5x = 62$. So, the revenue for selling 62 prints per year is \$1562.40 and the price per unit is \$25.20. If Michael sells 63 prints per year, the revenue is given by $R(7.4)$ where 7.4 is found by solving $100 - 5x = 63$. So, the revenue for selling 63 prints per year is \$1562.40 and the price per print is \$24.80. Can you explain why the revenue is the same for selling 62 and 63 prints?

   b. The horizontal intercepts of $y = R(x)$ are $(20, 0)$ and $(-5, 0)$.

   The horizontal intercept (20,0) means that Michael has increased the price of his print by 2 dollars 20 times and he has a revenue of \$0. This means that no one feels Michael's prints are worth buying at \$50 per print (evaluate $2x + 10$ with $x = 20$) – poor Michael! The horizontal intercept $(-5, 0)$ means that Michael has increased the price of his print by \$2, "-5 times" (i.e., he has decreased the price by \$2, 5 times) and he has a revenue of \$0 because he would be giving his prints away for free (evaluate $2x + 10$ with $x = -5$).

7. For $D(t) = -t^2 + 2t + 8$:

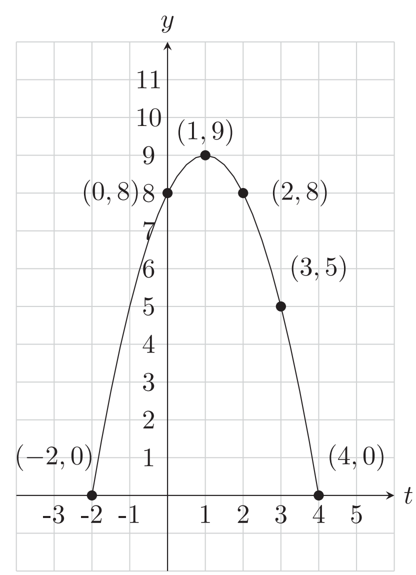
   a. $D(3) = 5$ represents that 3 hours after the storm ends the L.A. River is 5 feet deep.

   b. The y-intercept is $(0, 8)$ meaning that at the end of the storm the river is 8 feet deep.

   c. The t-intercepts are $(-2, 0)$ and $(4, 0)$. These represent that 2 hours before the storm ends and 4 hours after it ends the river is at 0 feet in depth.

   d. We find the maximum of $D(t)$ which occurs at the vertex $(1, 9)$ meaning the water reaches a maximum depth of 9 feet 1 hour after the storm ends.

   e.



Graph of $y = D(t)$.

   f. The range of D is $[0, 9]$ since the L.A. river can have a depth of anywhere between and including 0 to 9 feet of water.

8. For $f(x) = -0.002x^2 + 0.6x + 60$:

   a. The vertex is $(150, 105)$. This represents the maximum height which the piano will reach of 105 feet and telling that it occurs 150 feet horizontally from the launch point.

   b. If you want to crush a Volkswagen with the piano you should park it about 379.13 feet in front of the trebuchet.

ANSWERS TO SUPPLEMENT §8.6:

1. a. $f(-3) = -16$

   b. $g(0) = -1$

   c. $x = 6$. That is, the solution set is $\{6\}$.

   d. $g(-3) = 2$

   e. $h(3) = -4$

   f. If $g(x) = 2$ then $x = 1$ or $x = -3$.

   g. $h(-7) = -3$

   h. $h(-3)$ is undefined.

   i. If $h(x) = 0$, then $x = 5$.

   j. The domain of g is $(-4, 1] = \{x | -4 < x \leq 1\}$.

   k. The range of g is $[-2, 7) = \{y | -2 \leq y < 7\}$.

   l. The domain of h is $\{-7, 0, 1, 3, 5, 10\}$.

   m. The range of h is $\{-4, -3, 0, 3, 64\}$.

2. a. $P(3) = 8$ meaning that three years after 2005 (2008) the profit of this business was $8,000.

   b. $P(0) = 17$ meaning that in 2005 the profit of this business was $17,000.

3. a. $f(3) \approx 51$ meaning that 3 seconds after the ball is hit it is 51 feet high.

   b. $f(t) = 20$ when t is approximately 0.25 and 3.75 meaning that the ball is 20 feet up 0.25 and 3.75 seconds after being hit.

   c. The ball will be at a height of 50 feet approximately 0.9 and 3.1 seconds after being hit.

   d. The domain is approximately $[0, 4.1]$ meaning that this function, as described by the graph, takes time inputs from zero to 4.1 seconds. The range is approximately $[0, 67]$ meaning that this function, as described by the graph, outputs heights of the ball ranging from 0 to 67 feet above the ground.