Test Bank for College Algebra in Context with Applications for the Managerial Life and Social Sciences 6th Harshbarger

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INSTRUCTOR'S TESTING MANUAL

JAMES LAPP

COLLEGE ALGEBRA IN CONTEXT

WITH APPLICATIONS FOR THE MANAGERIAL, LIFE, AND SOCIAL SCIENCES

SIXTH EDITION

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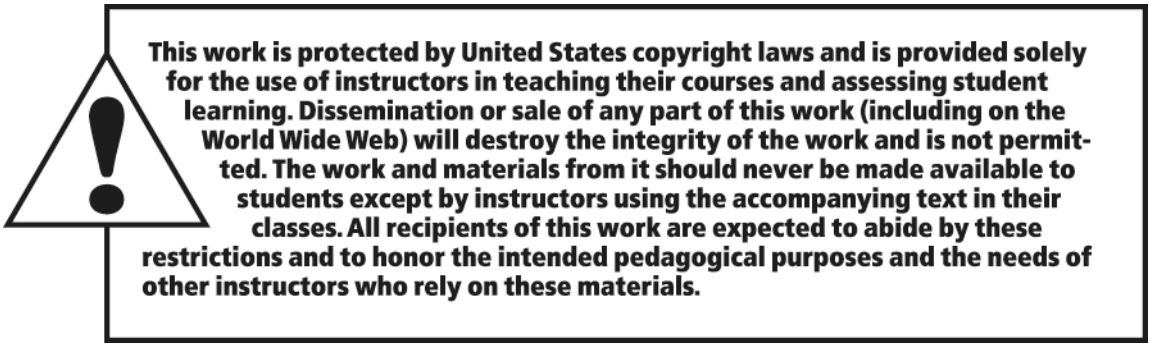

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1. Determine which of the following relations indicates that y is NOT a function of x.

   a. Relationship 1: The number of minutes, y billed to a cell phone on a given day, x, in September.

   Relationship 2: The pet, y (name of pet), of a child, x (name of child), at one school.

   b.

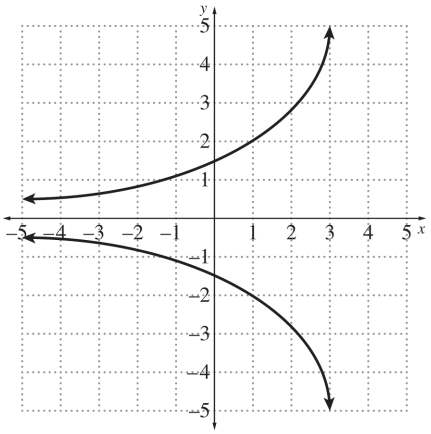
Table 1

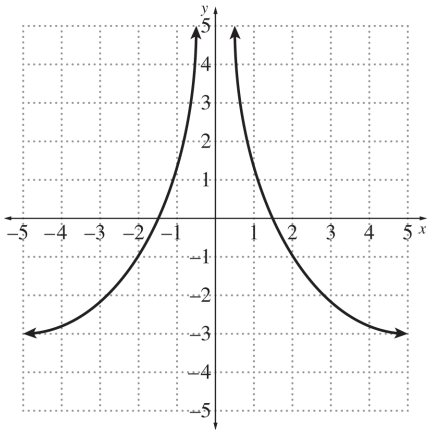
x	−2	−1	0	1	2
y	4	3	2	3	4

Table 2

x	4	3	2	3	4
y	−2	−1	0	1	2

   c.





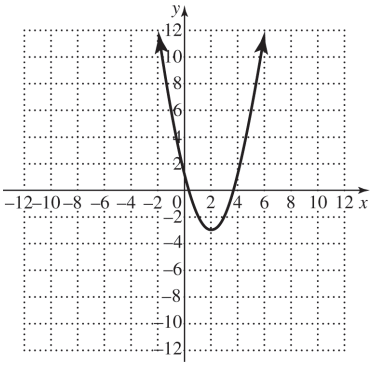
   d. Equation 1: $2y^2 - 5x = 11$ Equation 2: $2x^2 - 5y = 11$

2. Determine the domain and range for each function.

   a.

x	−4	−2	0	1	3	5	8
$f(x)$	6	3	−7	−3	0	3	2

   b.



   c. $f(x) = 5x - 7$

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3. The number of cars sold by a dealership is given by $N(x) = 56x + 78$ cars, x years after the dealership was founded in 2010.
   a. How many cars were sold by the dealership in 2013?
   b. Find and interpret the y-intercept of the function.
   c. Find the rate of change in the number of cars sold by the dealership.
4. Find the slope and y-intercept for each linear equation.
   a. $y = 3x + 7$
   b. $3x - 5y = 10$
   c. $y = \frac{2}{5}x$
5. Graph each function using graphing technology and a standard viewing window of $[-10,10]$ and $[-10,10]$. Determine the x-intercept(s) and y-intercept of each function, if they exist.
   a. $y = -5x - 7$
   b. $y = \frac{3}{x-2}$
   c. $y = x^4 + x^3 - 2x^2$
6. Write the equation of a line through the point $(1,-2)$ for each of the given conditions.
   a. parallel to $3x + 2y = 6$
   b. perpendicular to $y = \frac{1}{4}x - 5$
   c. perpendicular to the x-axis
7. For each of the given conditions, write the equation of a line.
   a. slope of $-\frac{2}{5}$ and y-intercept of 6
   b. slope of -4 and passing through the point $(2,-5)$
   c. passing through the two points $(-7,-2)$ and $(-3,6)$
8. The table shows the number of downloads of an author's eBook from 2015 to 2019.

Year	2015	2016	2017	2018	2019
eBooks downloaded (hundreds)	55	67	79	91	103

   a. Find the linear model where x is the number of years after 2015, and y is the number of eBooks downloaded (in hundreds).
   b. Use the model to predict the number of downloads in 2024.

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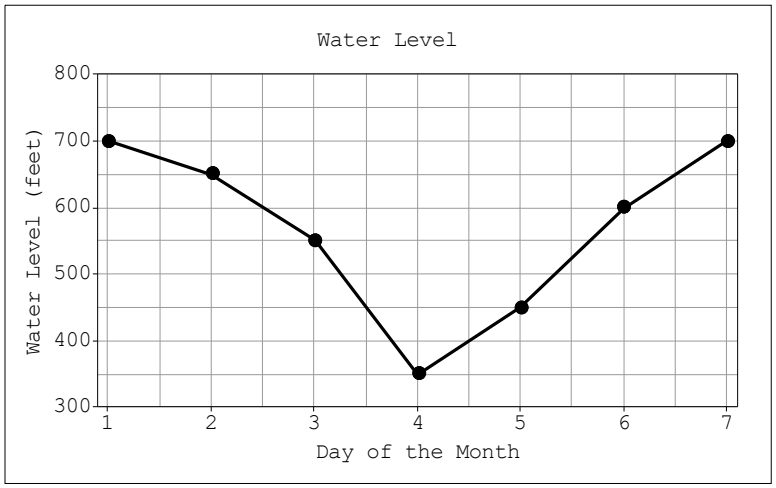
9. The price of gas, p (in dollars), for a gallon of gas in a region of the US is given by the function $p(x) = 0.000002x^3 - 0.0004x^2 + 0.03x + 2.69$, where x is the number of days after May 1, 2015.

   a. Determine $p(25)$. (Round your answer to the nearest hundredth.)

   b. On what day is the price of gas approximately \$3.09? (Use graphing technology to graph the function $p(x)$ for $0 \le x \le 20$.)

10. The points on the figure below give the water level, in feet, of a reservoir for a range of days of a month.



   a. What is the domain of the function represented by the graph

   b. What was the approximate level of the reservoir on day 5 of the month?

   c. On what day of the month was the level of the reservoir approximately 600 feet?

11. A company produces and sells a toy with revenue given by $R(x) = 19.99x$ dollars and cost given by $C(x) = 12.75x + 590$ dollars, where x is the number of toys produced and sold.

   a. What is the marginal revenue for this toy, and what does it mean?

   b. Find the profit function.

   c. What is the marginal profit for this toy, and what does it mean?

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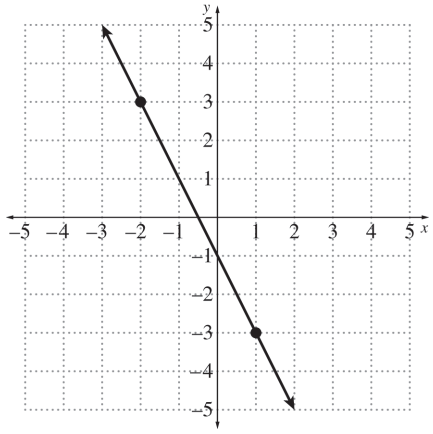
12. Write the equation of the line for each of the following graphs.

a.



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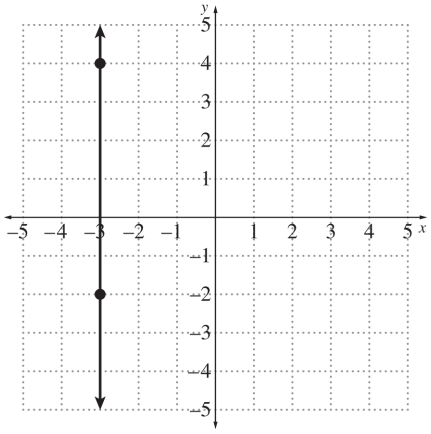
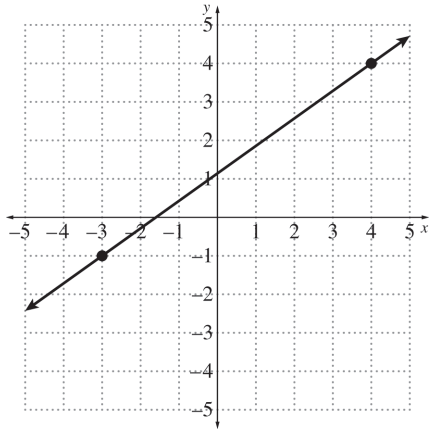


b.



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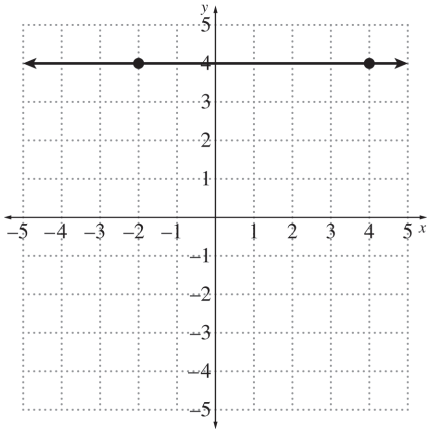

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1. Determine which of the following relations indicates that y is NOT a function of x.

   a. Relationship 1: The number of miles, y, on the meter of a taxi for one fare during the day, x.

   Relationship 2: The book, y (title of book), read by a child, x (name of child), in one family.

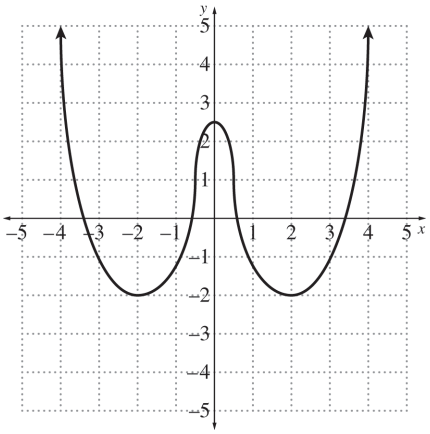
   b. Table 1

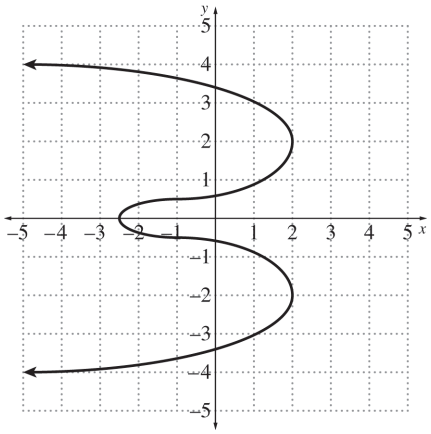
x	4	6	8	6	4
y	−5	−3	0	3	5

Table 2

x	−5	−3	0	3	5
y	4	6	8	6	4

   c.





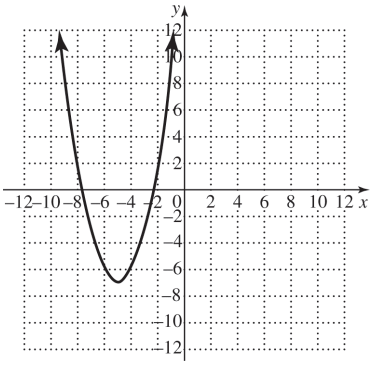
   d. Equation 1: $x^2 = 3y - 7$ Equation 2: $y^2 = 3x - 7$

2. Determine the domain and range for each function.

   a.

x	−3	−1	0	2	5	7	9
$f(x)$	4	−2	6	8	0	6	−3

   b.



   c. $f(x) = -3x + 4$

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3. The number of houses in a new subdivision from 2010 and 2016 is given by $N(x) = 8x + 11$ houses, x years after the subdivision was started in 2010.
   a. How many houses were in the subdivision in 2014?
   b. Find and interpret the y-intercept of the function.
   c. Find the rate of change in the number in the subdivision.
4. Find the slope and y-intercept for each linear equation.
   a. $y = 5x - 3$
   b. $4x - 3y = 18$
   c. $y = \frac{7}{5}x$
5. Graph each function using graphing technology and a standard viewing window of $[-10,10]$ and $[-10,10]$. Determine the x-intercept(s) and y-intercept of each function, if they exist.
   a. $y = 3x - 8$
   b. $y = -\frac{2}{x+10}$
   c. $y = x^4 + x^3 - 20x^2$
6. Write the equation of a line through the point $(-3,7)$ for each of the given conditions.
   a. parallel to $3x - 2y = 5$
   b. perpendicular to $y = \frac{1}{2}x + 3$
   c. perpendicular to the y-axis
7. For each of the given conditions, write the equation of a line.
   a. slope of $-\frac{4}{3}$ and y-intercept of -7
   b. slope of 5 and passing through the point $(-3,2)$
   c. passing through the two points $(-5,6)$ and $(-1,-2)$
8. The table shows the number of downloads of an author's eBook from 2015 to 2019.

Year	2015	2016	2017	2018	2019
eBooks downloaded (hundreds)	47	56	65	74	83

   a. Find the linear model where x is the number of years after 2015, and y is the number of eBooks downloaded (in hundreds).
   b. Use the model to predict the number of downloads in 2024.

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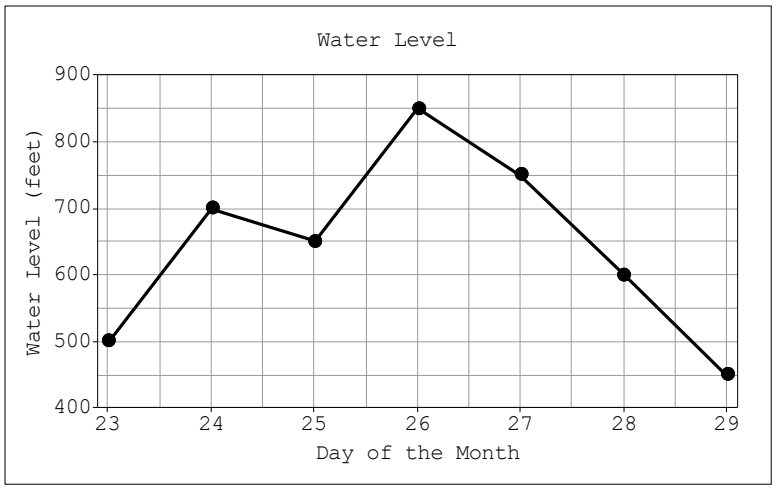
9. The time, t (in minutes), it takes to get to class from your room each day is given by the function $t(x) = -0.0373x^3 + 0.308x^2 - 0.395x + 7.95$, where x is the number of days since the start of the semester.

   a. Determine $t(9)$. (Round your answer to the nearest hundredth.)

   b. Approximately how many days have passed, if it takes you 7.48 minutes to get to class from your room? (Use graphing technology to graph the function $t(x)$ for $0 \le x \le 10$.)

10. The points on the figure below give the water level, in feet, of a reservoir for a range of days of a month.



   a. What is the domain of the function represented by the graph?

   b. What was the approximate level of the reservoir on day 25 of the month?

   c. On what day of the month was the level of the reservoir approximately 700 feet?

11. A company produces and sells a wireless speaker with revenue given by $R(x) = 79.99x$ dollars and cost given by $C(x) = 52.68x + 3584$ dollars, where x is the number of wireless speakers produced and sold.

   a. What is the marginal revenue for this wireless speaker, and what does it mean?

   b. Find the profit function.

   c. What is the marginal profit for this wireless speaker, and what does it mean?

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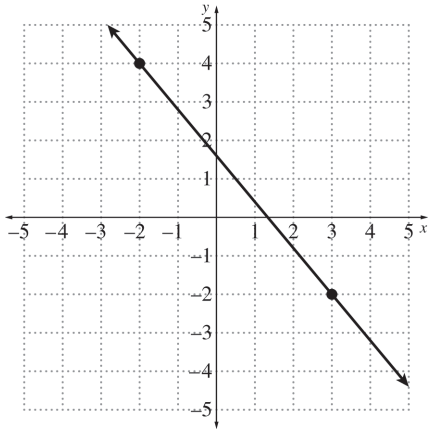
12. Write the equation of the line for each of the following graphs.

a.



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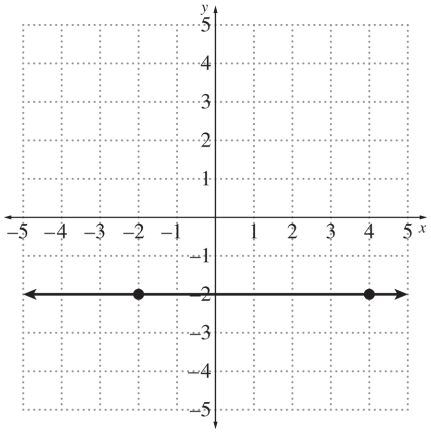

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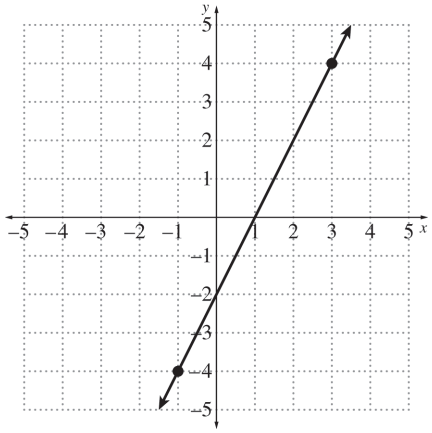

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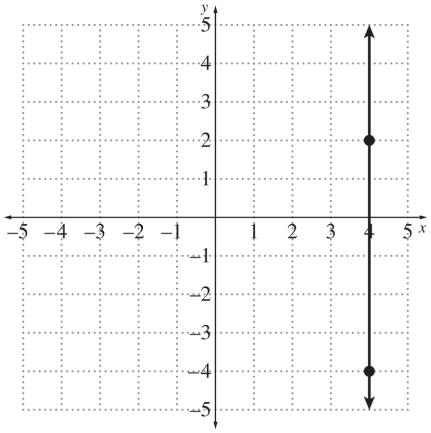

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1. Determine which of the following relations indicates that y is NOT a function of x.

   a. Relationship 1: The salary of a person, y (in dollars), based on the number of years employed, x (in years).

   Relationship 2: The uncle, y (name of uncle), of a child, x (name of child), in a family where the father has 3 brothers.

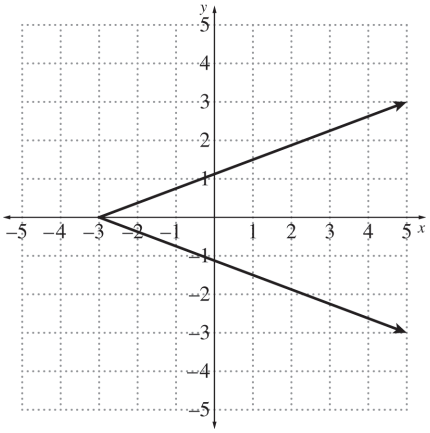
   b. Table 1

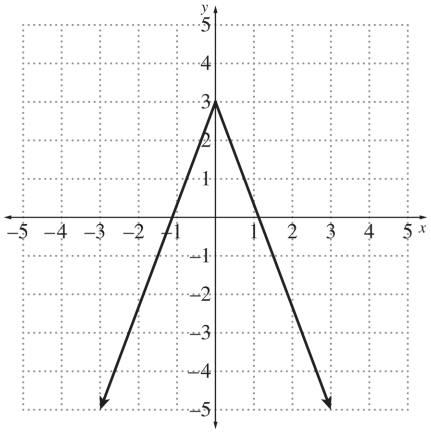
x	−2	−1	0	1	2
y	7	8	9	8	7

   Table 2

x	7	8	9	8	7
y	−2	−1	0	1	2

   c.





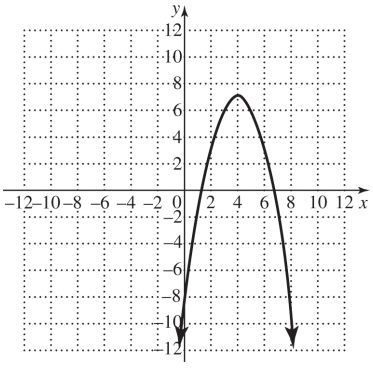
   d. Equation 1: $|y| = 2x - 8$ Equation 2: $|x| = 2y - 8$

2. Determine the domain and range for each function.

   a.

x	−5	−1	0	3	5	6	9
$f(x)$	8	4	−7	−5	−2	0	4

   b.



   c. $f(x) = 2x + 1$

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3. The number of appliances sold by a retailer is given by $N(x) = 72x + 125$ appliances, x years after the retailer opened for business in 2010.
   a. How many appliances were sold by the dealership in 2014?
   b. Find and interpret the y-intercept of the function.
   c. Find the rate of change in the number of appliances sold by the retailer.
4. Find the slope and y-intercept for each linear equation.
   a. $y = 2x + 6$
   b. $3x - 5y = 20$
   c. $y = \frac{4}{3}x$
5. Graph each function with a graphing calculator using the standard viewing window of $[-10,10]$ and $[-10,10]$. Determine the x-intercept(s) and y-intercept of each function, if they exist.
   a. $y = -2x + 3$
   b. $y = \frac{2}{3x + 4}$
   c. $y = -x^4 - 3x^3 + 4x^2$
6. Write the equation of a line through the point $(-3,2)$ for each of the given conditions.
   a. parallel to $-3x + 2y = 7$
   b. perpendicular to $y = \frac{1}{5}x - 6$
   c. perpendicular to the x-axis
7. For each of the given conditions, write the equation of a line.
   a. slope of $-\frac{3}{7}$ and y-intercept of -8
   b. slope of -6 and passing through the point $(-5,3)$
   c. passing through the two points $(-4,3)$ and $(-2,-1)$
8. The table shows the number of downloads of an author's eBook from 2015 to 2019.

Year	2015	2016	2017	2018	2019
eBooks downloaded (hundreds)	29	42	55	68	81

   a. Find the linear model where x is the number of years after 2015, and y is the number of eBooks downloaded (in hundreds).
   b. Use the model to predict the number of downloads in 2024.

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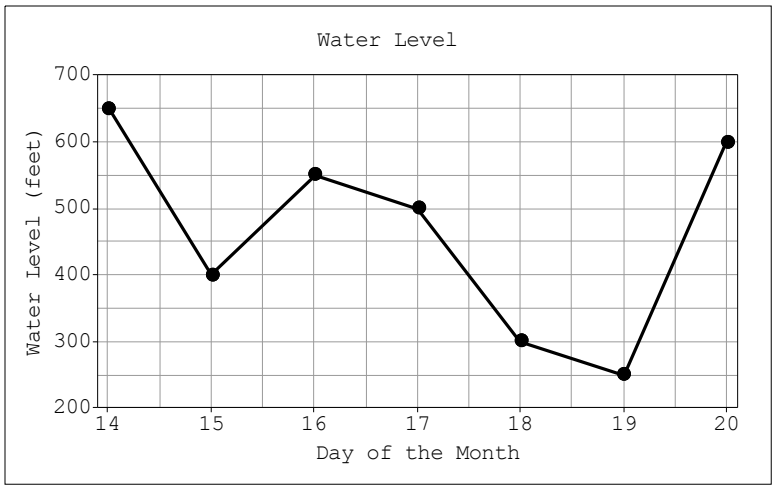
9. The price for a gallon of 2% milk, p (in dollars), for a six-year period is given by the function $p(x) = 0.0325x^3 - 0.1975x^2 + 0.453x + 2.95$, where x is the number of years since 2003.

   a. Determine $p(2)$. (Round your answer to the nearest hundredth.)

   b. In what year did a gallon of milk cost approximately \$3.68? (Use graphing technology to graph the function $p(x)$ for $0 \le x \le 5$.)

10. The points on the figure below give the water level, in feet, of a reservoir for a range of days of a month.



   a. What is the domain of the function represented by the graph?

   b. What was the approximate level of the reservoir on day 16 of the month?

   c. On what day of the month was the level of the reservoir approximately 300 feet?

11. A company produces and sells a small drone with revenue given by $R(x) = 119.99x$ dollars and cost given by $C(x) = 87.35x + 9731$ dollars, where x is the number of small drones produced and sold.

   a. What is the marginal revenue for this wireless speaker, and what does it mean?

   b. Find the profit function.

   c. What is the marginal profit for this small drone, and what does it mean?

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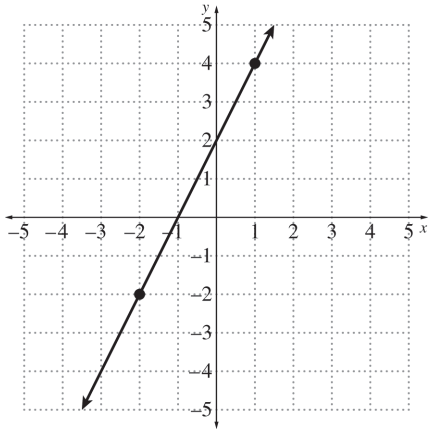
12. Write the equation of the line for each of the following graphs.

a.



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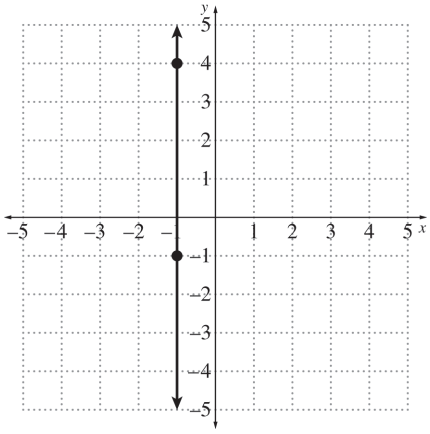

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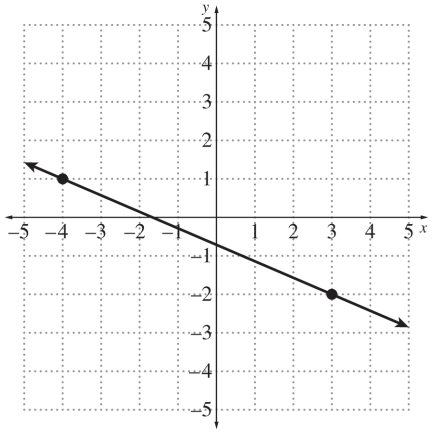
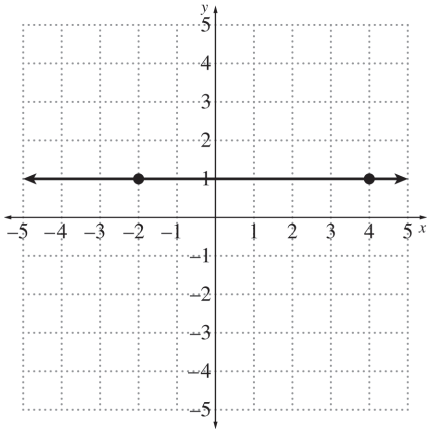


d.



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1. Given the literal equation $A = P(1+rt)$,
   a. solve the equation for P.
   b. solve the equation for t.
2. For the function $f(x) = 8 + \frac{3}{4}x$,
   a. find the solution to $f(x) = 0$.
   b. find the x-intercept of $f(x)$.
   c. find the zero of the function $f(x)$.
3. Given the equation $3x + 7 = 5(x+2) - x$,
   a. solve the equation algebraically.
   b. solve the equation graphically.
   c. use your graph from (b) and the intersection method to solve the linear inequality $3x + 7 > 5(x+2) - x$. State the solution in interval notation.
4. A band wants to make shirts to sell at their concerts. The cost to make x shirts is given by $C(x) = 6.5x + 140$ dollars. The band plans to sell them for \$10. Find the number of units that gives break-even for the shirts.
5. An office manager is choosing between two options for a new printing service. Plan A has a monthly fee of \$40 and charges \$0.08 per page printed. Plan B has a monthly fee of \$32 and charges \$0.10 per page printed. How many pages must the office print in a month for Plan A to be less expensive?
6. Denise is saving money to buy a new 3D printer that costs \$1560 for her company. Denise models her savings by the equation $y = 65x + 585$ dollars, where x is the number of consecutive months, and y is her total savings. If Denise began saving in January 2020 and continues saving each month thereafter, in what month and year will she be able to buy her 3D printer?
7. The price of an electronics item is influenced by the number of years since 2015. Use the data in the table to answer the given questions.

Number of Years after 2015	0	3	6	9	11
Price (in dollars)	1199.95	1113.28	1026.61	939.94	882.16

   a. Can a linear function exactly model the points from the data? Explain.
   b. Find a linear model that fits the data; round to two decimal places.
   c. Should the data be interpreted as discrete or continuous?
   d. If you use the linear model to find the price after the year 2020, is this considered interpolation or extrapolation of the data?

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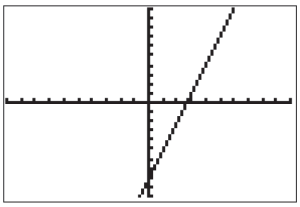
1. a. Relationship 2
   b. Table 1
   c. Graph 2
   d. Equation 2

2. a. Domain: $\{-3,-1,0,2,5,7,9\}$
   Range: $\{-3,-2,0,4,6,8\}$
   b. Domain: $(-\infty,\infty)$; Range: $[-5,\infty)$
   c. Domain: $(-\infty,\infty)$; Range: $(-\infty,\infty)$

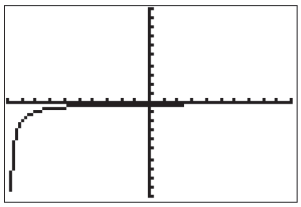
3. a. There were 43 houses in the subdivision in 2014.
   b. The y-intercept is 11. There were 11 houses in the subdivision in 2010.
   c. The rate of change is 8 houses in the subdivision per year.

4. a. The slope is 5; the y-intercept is $(0,-3)$.
   b. The slope is $\frac{4}{3}$; the y-intercept is $(0,-6)$.
   c. The slope is $\frac{7}{5}$; the y-intercept is $(0,0)$.

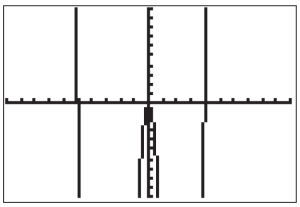
5. a. x: $\left(\frac{8}{3},0\right)$; y $(0,-8)$



   b. x: none; y: $\left(0,-\frac{1}{5}\right)$



   c. x: $(-5,0)$, $(0,0)$, $(4,0)$
   y: $(0,0)$



6. a. $y=\frac{3}{2}x+\frac{23}{2}$
   b. $y=-2x+1$
   c. $y=7$

7. a. $y=-\frac{4}{3}x-7$
   b. $y=5x+17$
   c. $y=-2x-4$

8. a. $y=9x+47$ hundred downloads, x years after 2015.
   b. 12,800 eBooks will be downloaded in 2024.

9. a. $t(9)=2.15$
   b. 7 days

10. a. $[23,29]$
    b. 650 feet
    c. Day 24

11. a. The marginal revenue is \$79.99 per unit sold. The sale of each additional wireless speaker will result in additional revenue of \$79.99.
    b. $P(x)=27.31x-3584$
    c. The marginal profit is \$27.31 per unit sold. The production and sale of each additional wireless speaker will result in an additional profit of \$27.31.

12. a. $y=-\frac{6}{5}x+\frac{8}{5}$
    b. $y=2x-2$
    c. $y=-2$
    d. $x=4$

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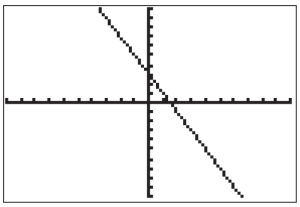
1. a. Relationship 2
   b. Table 2
   c. Graph 1
   d. Equation 1

2. a. Domain: $\{-5,-1,0,3,5,6,9\}$
   Range: $\{-7,-5,-2,0,4,8\}$
   b. Domain: $(-\infty,\infty)$; Range: $(-\infty,7]$
   c. Domain: $(-\infty,\infty)$; Range: $(-\infty,\infty)$

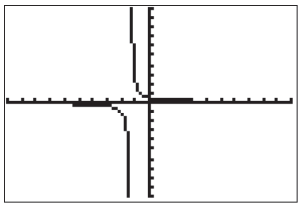
3. a. 413 appliances were sold by the retailer in 2014.
   b. The y-intercept is 125. 125 appliances were sold by the retailer in 2010.
   c. The rate of change is 72 appliances sold by the retailer per year.

4. a. The slope is 2; the y-intercept is $(0,6)$.
   b. The slope is $\frac{3}{5}$; the y-intercept is $(0,-4)$.
   c. The slope is $\frac{4}{3}$; the y-intercept is $(0,0)$.

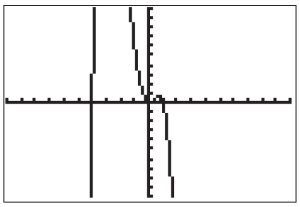
5. a. x: $\left(\frac{3}{2},0\right)$; y: $(0,3)$



   b. x: none; y: $\left(0,\frac{1}{2}\right)$



   c. x: $(-4,0)$, $(0,0)$, $(1,0)$
   y: $(0,\ 0)$



6. a. $y=\frac{3}{2}x+\frac{13}{2}$
   b. $y=-5x-13$
   c. $x=-3$

7. a. $y=-\frac{3}{7}x-8$
   b. $y=-6x-27$
   c. $y=-2x-5$

8. a. $y=13x+29$ hundred downloads, x years after 2015.
   b. 14,600 eBooks will be downloaded in 2024.

9. a. $p(2)=\$3.33$
   b. year 4; 2007

10. a. $[14,20]$
    b. 550 feet
    c. Day 18

11. a. The marginal revenue is \$79.99 per unit sold. The sale of each additional small drone will result in additional revenue of \$79.99.
    b. $P(x)=32.64x-9731$
    c. The marginal profit is \$32.64 per unit sold. The production and sale of each additional small drone will result in an additional profit of \$32.64.

12. a. $y=2x+2$
    b. $y=-\frac{3}{7}x-\frac{5}{7}$
    c. $x=-1$
    d. $y=4$

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1. a. $P = \dfrac{A}{1+rt}$

   b. $t = \dfrac{A-P}{rP}$

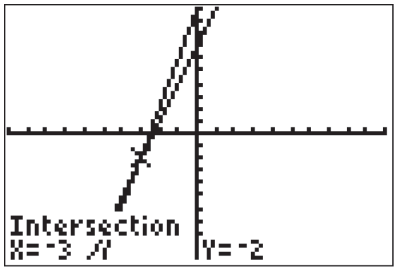
2. a. $x = -\dfrac{32}{3}$

   b. $\left(-\dfrac{32}{3}, 0\right)$

   c. $x = -\dfrac{32}{3}$

3. a. $x = -3$

   b. $x = -3$



[–10, –10, 10, 10]

   c. $(-\infty, -3)$

4. In order to break even, the band will have to sell 40 shirts.

5. The office will have to print more than 400 pages in a month for Plan A to be less expensive.

6. Denise will have saved enough in 15 months, which is April 2021.

7. a. Yes, the first differences are constant at $-\$86.67$.

   b. $y = -28.89x + 1199.95$ dollars

   c. Continuous

   d. Extrapolation

8. a. $y = -1.5429x + 136.8286$

   b. The scatter plot appears somewhat linear with first differences ranging from -9.6 to 2.2.

   c. 44.255 mpg (44.257 using technology with unrounded coefficients.)

   d. For every 1 unit increase in engine horsepower, MPG decreases by 1.5429.

9. a. Both methods give the same solution of $(1, -4)$.

   b. Both methods give the same solution of $(-5, 7)$.

10. $x \geq 1$ or $[1, \infty)$

11. $[2.25, 4.25]$

12. A→I; B→III; C→II

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