CALCULUS AND ITS APPLICATIONS

Name:

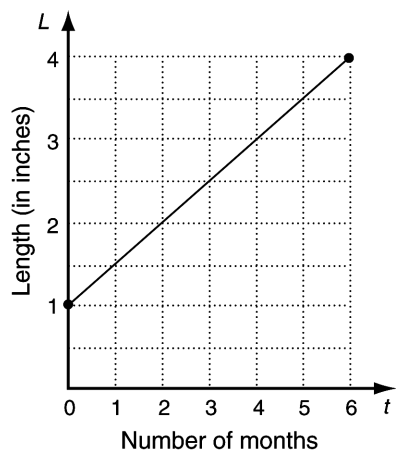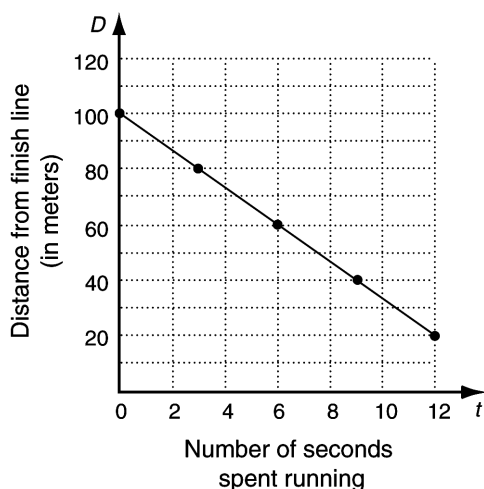## Chapter R, Form A

1. *Business: compound interest.* A person made an investment at 3.5%, compounded annually. It has grown to $2328.75 at the end of 1 yr. How much was originally invested?

1. _____

2. A function is given by $f(x) = 4x^2 + x$. Find (a) $f(-4)$ and (b) $f(x-2)$.

2. (a) _____

   (b) _____

3. What are the slope and the *y*-intercept of $y = 3x + 2$?

3. _____

4. Find an equation of the line with slope $\frac{2}{5}$, containing the point $(5, -2)$

4. _____

5. Find the slope of the line containing the points $(-6, 4)$ and $(2, -2)$.

5. _____

6. Find the average rate of change.

6. _____

7.

7._____

8. *Hooke's Law.* The distance d that a spring is stretched by a hanging object is directly proportional to the mass m of the object. A 5-kg object stretches a particular spring 16 cm. Find an equation of variation expressing d as a function of m.

8. _____

9. A campus coffee house has fixed costs of $9200 for equipment maintenance and space rental. Variable costs are approximately $1.27 for each cup of coffee. The revenue from each cup is expected to be $4.25.

   (a) Formulate a function $C(x)$ for the total cost of making x cups of coffee.

9. (a) _____

   (b) Formulate a function $R(x)$ for the total revenue from the sale of x cups of coffee.

   (b) _____

   (c) Formulate a function $P(x)$ for the total profit from the production and sale of x cups of coffee.

   (c) _____

   (d) How many cups of coffee must the coffee house sell in order to break even?

   (d) _____

10. *Economics: equilibrium point.* Find the equilibrium point for the demand and supply functions:

     Demand: $q = (x-4)^2,\ 0 \le x \le 4,$
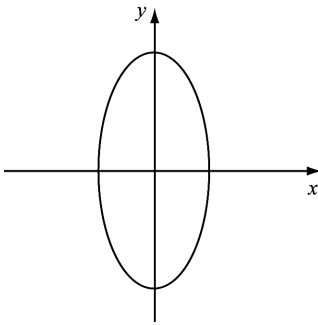   Supply: $q = x^2 + 3x + 5,$

10. _____

given that x is the unit price, in dollars, and q is the quantity demanded or supplied, in thousands.
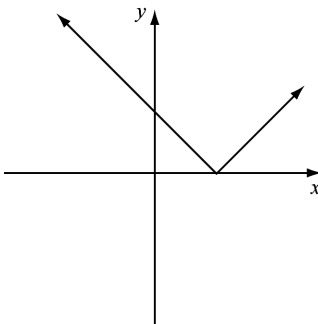
Use the vertical-line test to determine whether each of the following is the graph of a function.
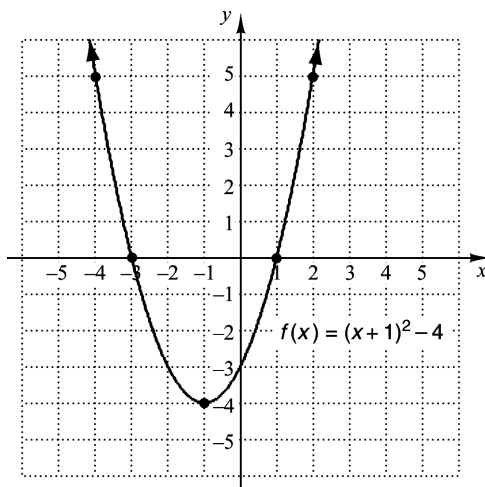
11.

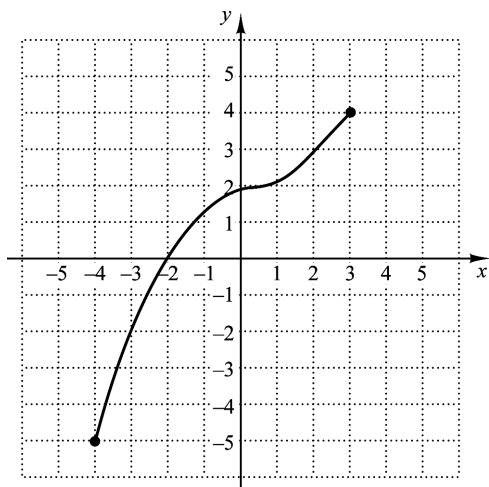11. _____

12.

12. _____

13. For the following graph of function f, determine
(a) $f(0)$; (b) the domain; (c) all x-values such that
$f(x) = 5$; and (d) the range.

$f(x) = (x+1)^2 - 4$
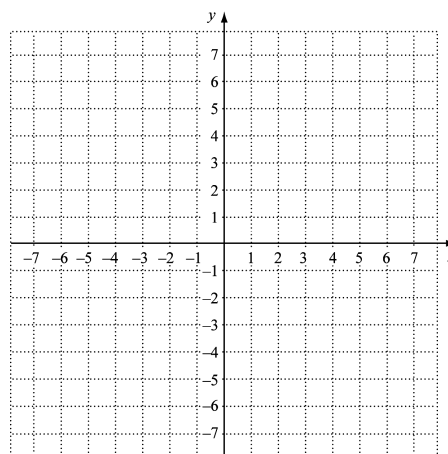
13. (a)_____

(b) _____

(c) _____

(d) _____

14. For the following graph of function f, determine (a) $f(2)$; (b) the domain; (c) all x-values such that $f(x) = 3$; and (d) the range.

14. (a) _____

    (b) _____

    (c) _____

    (d) _____

15. Graph: $f(x) = \dfrac{1}{x-2}$.

15.

16. Convert to rational exponents: $\dfrac{2}{\sqrt[5]{y^2}}$.
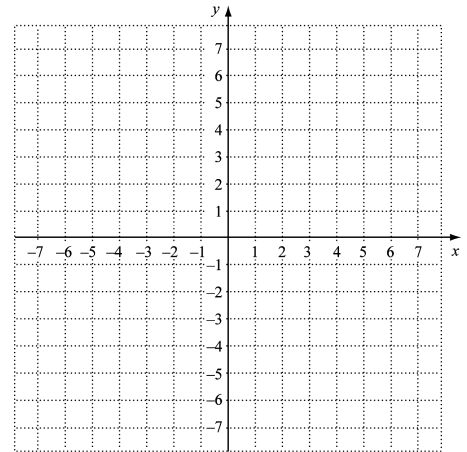
16. _____

17. Convert to radical notation: $x^{9/10}$.

17. _____

18. Graph: $f(x) = \dfrac{x^2 - 3x - 10}{x + 2}$.

18.

Determine the domain of the function.

19. $f(x) = \dfrac{x^2 + 3x}{x^2 - x - 2}$.

19. _____

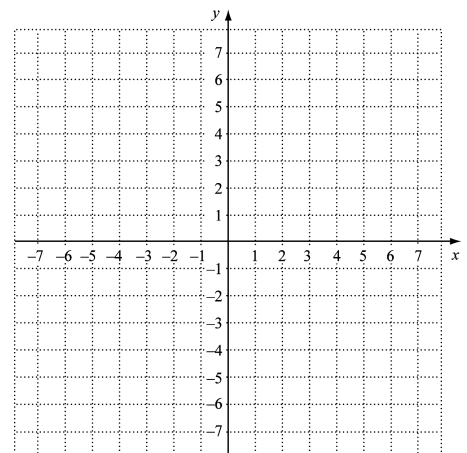**20.** $f(x) = \dfrac{x}{\sqrt{2x + 8}}$.

20. _____

21. Write interval notation for the following graph.

21. _____

22. Graph: $f(x) = \begin{cases} -x^2 - 3, \text{ for } x \geq -2 \\ x - 1, \quad \text{ for } x < -2 \end{cases}$.

22.

23. *Price of Movie Tickets.* The following table shows the price of movie tickets as they have increased from 1954 to 2009.

Number of years since 1950, x		Average Price of Movie Ticket, p
1954	4	0.49
1963	13	0.86
1971	21	1.65
1980	30	2.69
1990	40	4.22
2001	51	5.65
2009	59	7.50

(www.natoonline.org/statisticstickets.htm)

(a) Make a scatterplot of the data.

(b) Do the data appear to fit a quadratic function?

(c) Using the data points (4, 0.49), (30, 2.69) and (59, 7.50), find a quadratic function that fits the data.

(d) Use the function to estimate the average price of a movie ticket in 2015, 65 years after 1950.

23. (a)

(b) _____

(c) _____

(d) _____

---

24. Simplify: $(256^{-1/2})^{3/4}$.

24. _____

25. Write an equation with exactly three solutions; –8, 1, and 2. Answers will vary
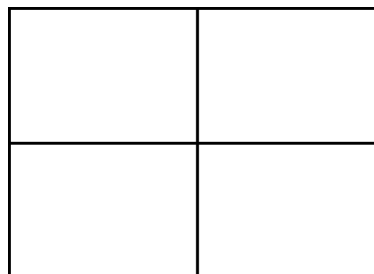
25. _____

26. A function's average rate of change over the interval [2, 7] is $-\frac{4}{5}$. If $f(2)=-3$, find $f(7)$.

26. _____

---

27. Graph the function and find the zeros and the domain and range:

$$f(x) = \sqrt[3]{|x^2 - 9|} - 3.$$

27. _____

28. *Price of Movie Tickets.* Use the data in Question 23.

   (a) Use the REGRESSION feature to fit a quadratic function to the data.

   (b) Use the function from part (a) to predict the average price of a movie ticket in 2015, 65 years after 1950.
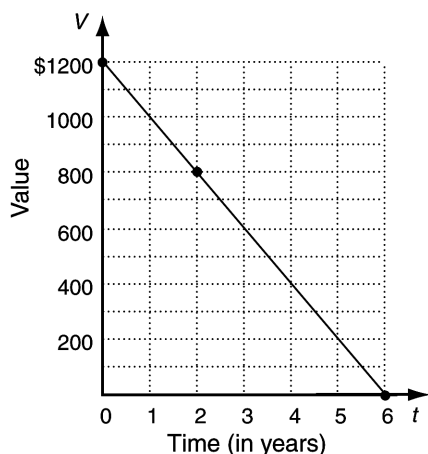
28. (a) _____

   (b)_____

Chapter R, Form B

1. *Business: compound interest.* A person made an investment at 2.9%, compounded annually. It has grown to $1131.90 at the end of 1 yr. How much was originally invested?

1. _____

2. A function is given by $f(x) = 2x^3 + 4$. Find (a) $f(-2)$ and (b) $f(x+a)$.

2. (a) _____
    (b) _____

3. What are the slope and the *y*-intercept of $y = 0.5x - 8$?

3. _____

4. Find an equation of the line with slope $\frac{5}{8}$, containing the point (6, –2).

4. _____

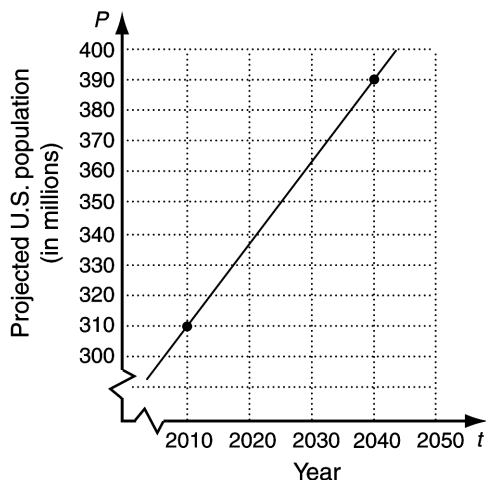5. Find the slope of the line containing the points (–5, 4) and (3, –6).

5. _____

Find the average rate of change

6. _____

6.

7.

www.geography.about.com/od/obtainpopulationdata/a/uspopulation.htm)

7._____

8. *Pressure of Liquid.* The pressure P exerted at any point on the base of a tank filled with liquid is directly proportional to the depth D of the liquid. The pressure is 12.6 *g/cm*^{2} when the liquid is 32 cm deep. Find an equation of variation expressing P as a function of D.

8. _____

9. Nu-Image Salon just added manicures/pedicures to the list of services they offer. For the first year, the fixed costs associated with these services are $135,000. The variable costs for each manicure/pedicure are $18. The revenue from the sale of each manicure/pedicure service is $45.

  (a) Formulate a function $C(x)$ for the total cost of providing x manicure/pedicure services.

  (b) Formulate a function $R(x)$ for the total revenue from the sale of x manicure/pedicure services.

  (c) Formulate a function $P(x)$ for the total profit from the sale of x manicure/pedicure services.

  (d) How many manicures/pedicures must the salon sell in order to break even?

9. **(a)** _____

   (b) _____

   (c) _____

   (d) _____

10. *Economics: equilibrium point.* Find the equilibrium point for the demand and supply functions:
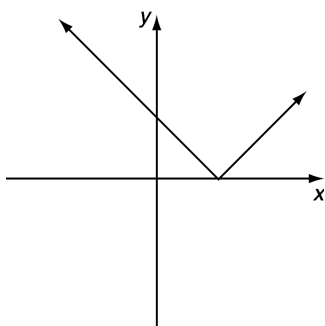
$$\text{Demand:} \, q = (x-8)^2, 0 \le x \le 8,$$

$$\text{Supply:} \, q = \frac{9}{25}x^2,$$

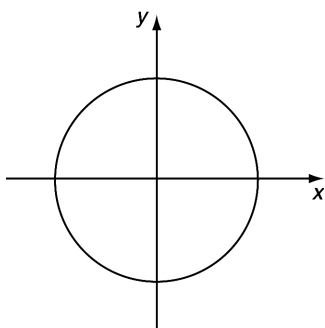given that x is the unit price, in dollars, and q is the quantity demanded or supplied, in thousands.

10. _____

Use the vertical-line test to determine whether each of the
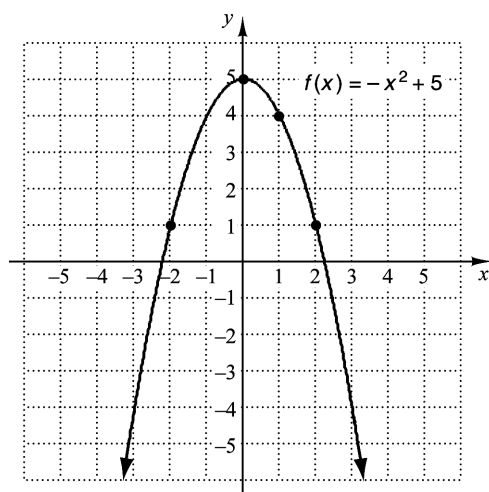following is the graph of a function.

11.

11. _____

12.

12. _____

13. For the following graph of function f, determine
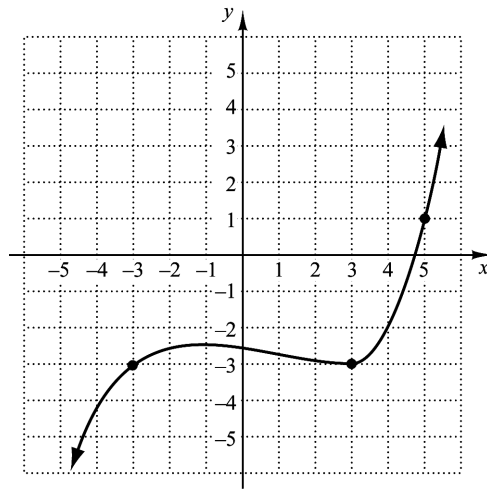(a) $f(1)$; (b) the domain; (c) x-values such that
$f(x) = 1$; and (d) the range.

13. (a) _____

     (b) _____

     (c) _____

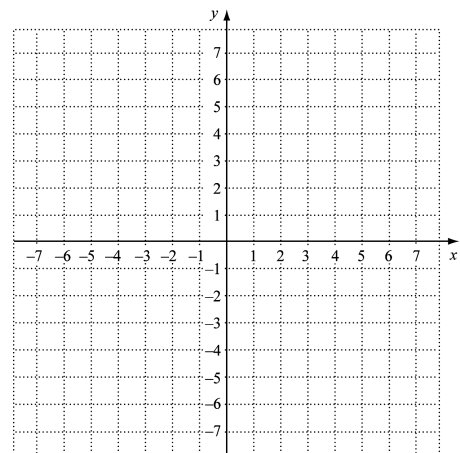   **(d)** _____

$f(x) = -x^2 + 5$

14. For the following graph of function f, determine (a) $f(5)$; (b) the domain; (c) all x-values such that $f(x) = -3$; and (d) the range.

14. (a) _____

(b) _____

(c) _____

(d) _____

15. Graph: $f(x) = \dfrac{2}{x}$.

15.

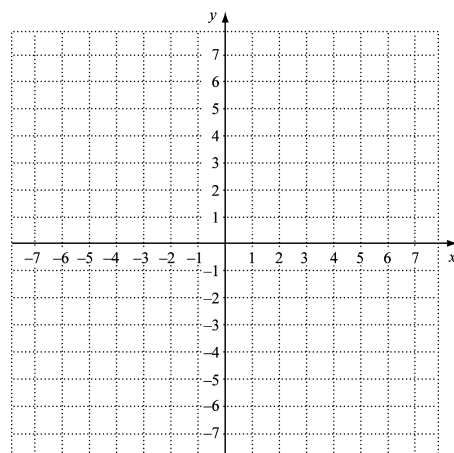**16.** Convert to rational exponents: $\dfrac{6}{\sqrt[5]{m}}$.

16. _____

17. Convert to radical notation: $x^{-3/4}$.

17. _____

18. Graph: $f(x)\dfrac{x^2-9}{x+3}$.

18.

Determine the domain of the function.

19. $f(x)=\dfrac{x^2+x}{x^2-4x-12}$.

19. _____

20. $f(x)=\dfrac{7x}{\sqrt{x-7}}$.
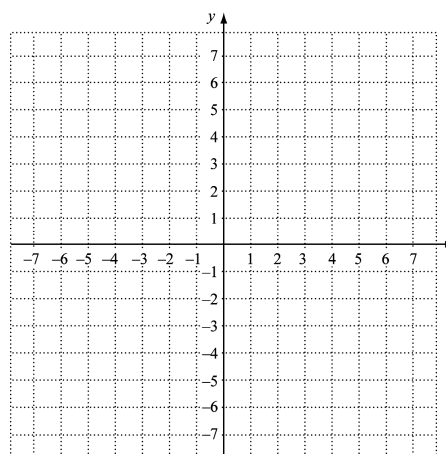
20. _____

21. Write interval notation for the following graph.

21. _____

22. Graph: $f(x)=\begin{cases} x^2-4, \text{ for } x>1 \\ x+3, \text{ for } x\le 1 \end{cases}$.

22. _____

23. *Gas Mileage,* The average gas mileage, in miles per gallon, depends in part on the speed the car is driven. For a particular sedan, the following data were collected.

Speed, s	Miles per gallon, M
30	20
35	24
40	28
45	30
55	32
60	32
70	24

(a) Make a scatterplot of the data.

(b) Do the data appear to fit a quadratic function?

(c) Using the data points (30, 20), (45, 30) and (70, 24), find a quadratic function that fits the data.

(d) Use the function from part (c) to estimate the gas mileage when the car is driven at 65 miles per hour.

23. (a) _____

(b) _____

(c) _____

(d) _____

24.   Simplify: $(8^{2/3})^{-5/2}$.

24. _____

25. Write an equation with, exactly three solutions: –2, 4, and 6. Answers will vary.
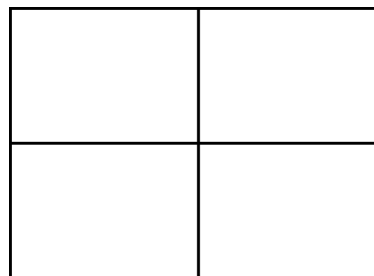
25. _____

26. A function's average rate of change over the interval [–2, 5] is $-\dfrac{2}{7}$. If $f(-2)=3$, find $f(5)$.

26. _____

27. Graph the function and the zeros and the domain and range of the function:

$$f(x)=\left|\sqrt{x^2-4}-5\right|-6.$$

27.

28. *Gas Mileage.* Use the data in Question 23.

    (a) Use the REGRESSION feature to fit a quadratic
function to the data.

    (b) Use the function from part (a) to predict the gas
mileage when the car is driven at 65 miles per hour.

28. **(a)** _____

      (b) _____

Chapter R, Form C

1. *Business: compound interest.* A person made an
   investment at 4.2%, compounded annually. It has
   grown to $781.50 at the end of 1 yr. How much was
   originally invested?

   1. _____

2. A function is given by $f(x) = 3x^2 - x$. Find (a) $f(-4)$
   and (b) $f(x+a)$.

   2. (a) _____

   (b) _____

3. What are the slope and the y-intercept of $y = 4x - \frac{1}{2}$?

   3. _____

4. Find an equation of the line with slope $-\frac{2}{5}$, containing
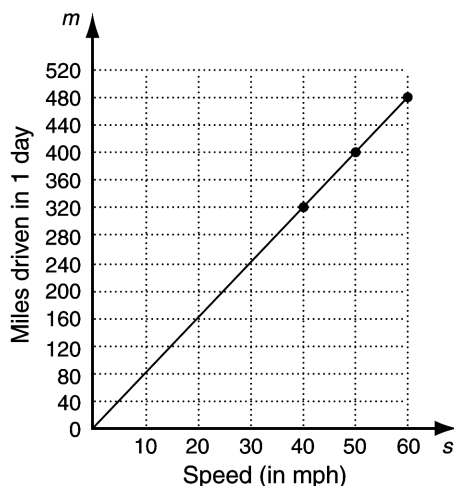   the point (5, –3).

   4. _____

5. Find the slope of the line containing the points (–9, 1)
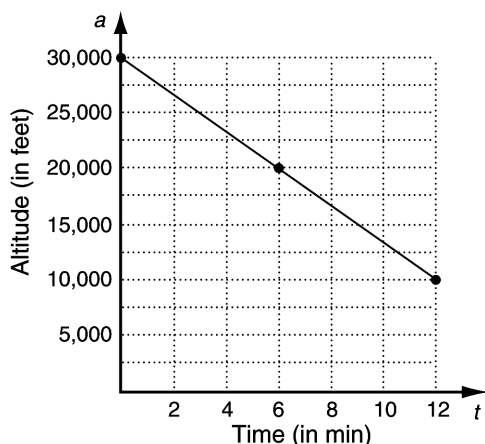   and (–5, –2).

   5. _____

Find the average rate of change.

6.

   6. _____

7.

7._____

8. *Mortgage Payment.* The monthly payment p on a mortgage is directly proportional to the amount borrowed B. For every \$1000 borrowed on a 30-yr mortgage, the payment is \$6.65. Find an equation of variation expressing p as a function of B.

8. _____

9. A small bicycle manufacturer has decided to introduce a new line of bicycles. For the first year, the fixed costs are \$500,000. The variable costs for producing each new bicycle are \$80. The revenue from the sale of each bicycle is expected to be \$175.

(a) Formulate a function $C(x)$ for the total cost of providing x bicycles.

(b) Formulate a function $R(x)$ for the total revenue from the sale.

(c) Formulate a function $P(x)$ for the total profit from the production and sale of x bicycles.

(d) How many bicycles must the manufacturer sell in order to break even?

9. (a) _____

(b) _____

(c) _____

(d) _____

10. *Economics: equilibrium point.* Find the equilibrium point for the demand and supply functions:
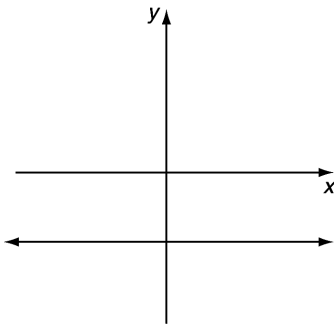
Demand: $q = (x-6)^2,\ 0 \le x \le 6,$

Supply: $q = x^2 + 5x + 2,$

given that x is the unit price, in dollars, and q is the quantity demanded or supplied, in thousands.
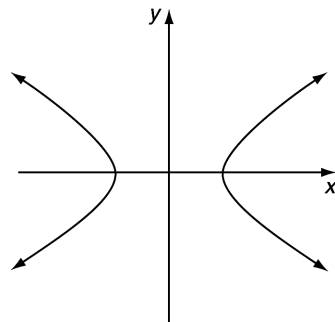
10. _____

Use the vertical-line test of determine whether each of the following is the graph of a function.

11. _____

11.

12. _____

12.

13. For the following graph of function f, determine
(a) $f(3)$; (b) the domain; (c) all x-values such that
$f(x) = -2$; and (d) the range.

13. (a) _____

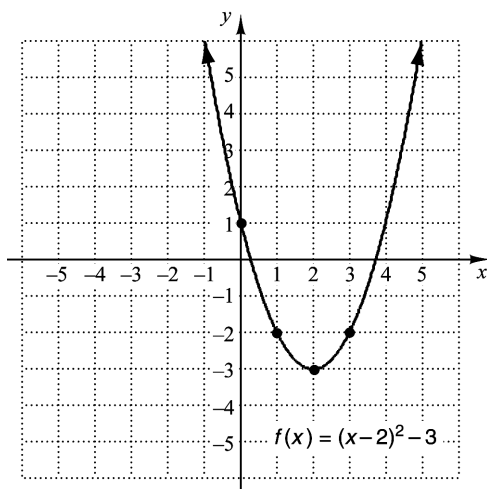**(b)** _____
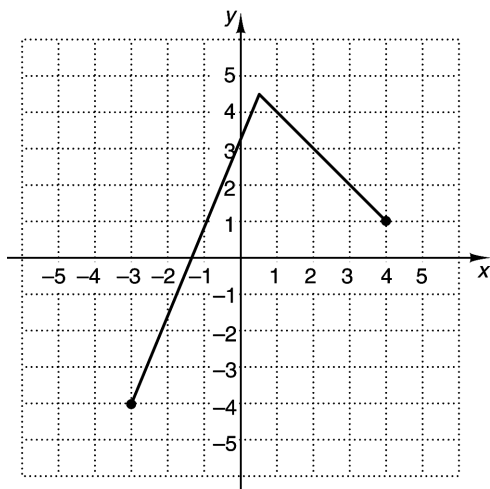
(c) _____

(d) _____

$$f(x) = (x-2)^2 - 3$$

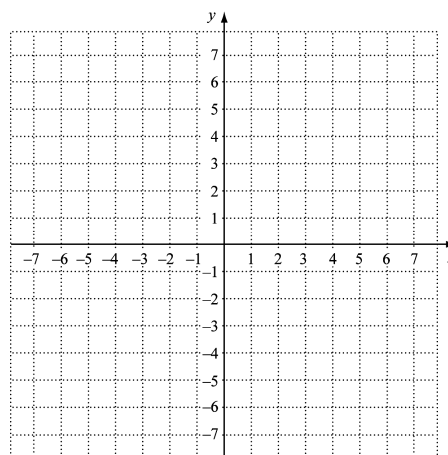**14.** For the following graph of function f, determine
(a) $f(3)$; (b) the domain; (c) all x-values such that
$f(x) = 1$; and (d) the range.

14. (a) _____

(b) _____

(c) _____

(d) _____

15. Graph: $f(x) = \dfrac{3}{x}$.

15.

16. Convert to rational exponents: $\dfrac{4}{\sqrt[6]{m^5}}$.

16. _____

17. Convert to radical notation: $y^{-1/3}$.

17. _____

18. Graph: $f(x)\dfrac{x^2+5x+6}{x+2}$.

18.

Determine the domain of the function.

19. $f(x)=\dfrac{x^2+3}{x^2-4x-32}$.

19. _____

20. $f(x)=\sqrt{3x-5}$.

20. _____

21. Write interval notation for the following graph.

21. _____

22. Graph: $f(x)=\begin{cases} x^2-4, \text{ for } x\geq 0 \\ x+1, \quad \text{ for } x<0 \end{cases}$.

22.

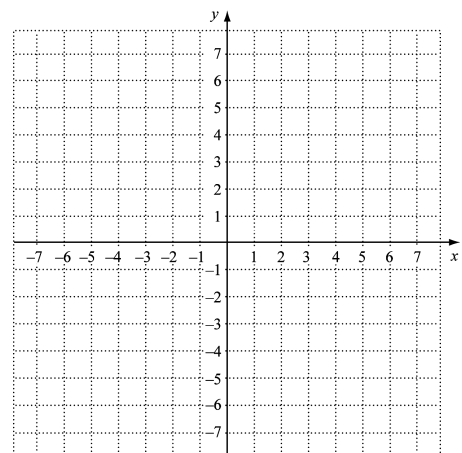**23.** *Household Income.* The following table shows the median U.S. household income for people of various ages.

Age, a	Median Income, i, in 2008 for the age group containing a
19.5	32,270
29.5	51,400
39.5	62,950
49.5	64,349
59.5	57,265

(Source: U.S. Bureau of the Census; age groups *a* - 5 yr to *a* + 5 yr for each *a*.)

(a) Make a scatterplot of the data.

(b) Do the data appear to fit a quadratic function?

(c) Using the data points (19.5, 32,270), (49.5, 64,349) and (59.5, 57,265), find a quadratic function that fits the data.

(d) Use the function from part (c) to estimate the income of a person of age 70.

23. (a)

(b) _____

(c) _____

(d) _____

---

24. Simplify: $(625^{5/2})^{1/10}$.

24. _____

25. Write an equation with exactly three solutions: –2, 0, and 5. Answers will vary.

25. _____

26. A function's average rate of change over the interval [–3, 1] is $-\frac{5}{4}$. If $f(-3)=6$, find $f=(2)$.

26. _____

27. Graph the function and find the zeros and the domain and range:

$$f(x)=\left|\sqrt{x^2-1}-3\right|-5.$$

27.

28. *Household Income.* Use the data in Question 23.

    (a) Use the REGRESSION feature to fit a quadratic function to the data.

    (b) Use the function from part (a) to predict the income of a person of age 70.

28. (a) _____

     (b) _____

Chapter R, Form D

1. *Business: compound interest.* A person made an investment at 4.5%, compounded annually. It has grown to $1567.50 at the end of 1 yr. How much was originally invested?

1. _____

2. A function is given by $f(x) = 2x^2 + 3$. (a) $f(-1)$ and (b) $f(a-3)$.

2. (a) _____

    (b) _____

3. What are the slope and the *y*-intercept of $y = 1.5x + 6$?

3. _____

4. Find an equation of the line with slope $\frac{2}{3}$, containing the point (3, –6).

4. _____

5. Find the slope of the line containing the points (6, – 5) and (2, 3).

5. _____

Find the average rate of change.

6.

6. _____

Number of years of use

7.

7._____

8. *Revenue.* At a corner gas station, the revenue R is directly proportional to the number g of gallons of gasoline sold. The revenue is $42.75 when 15 gallons of gas are sold. Find an equation of variation expressing R as a function of g.

8. _____

9. Innovative Technologies is planning to produce portable heart rate monitors. The fixed costs associated with this monitor are $21,000. Thereafter, the variable costs for producing each monitor are $28. The revenue from the sale of each monitor is expected to be $54.95.

   (a) Formulate a function $C(x)$ for the total cost of producing x heart rate monitors.

   9. **(a)** _____

   (b) Formulate a function $R(x)$ for the total revenue from the sale of x heart rate monitors.

   (b) _____

   (c) Formulate a function $P(x)$ for the total profit from the production and sale of x heart rate monitors.

   (c) _____

   (d) How many heart rate monitors must the manufacturer sell in order to break even?

   (d) _____

10. *Economics: equilibrium point.* Find the equilibrium point for the demand and supply functions:

   $$\text{Demand:} \, q = (x-7)^2, \, 0 \le x \le 7,$$
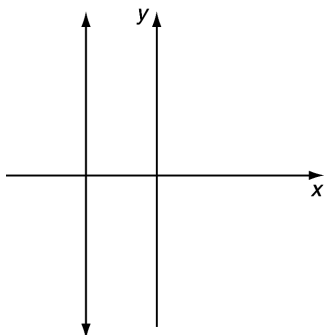
   $$\text{Supply:} \, q = \frac{1}{9}x^2,$$

   given that x is the unit price, in dollars, and q is the quantity demanded or supplied, in thousands.

10. _____

Use the vertical-line test to determine whether each of the following is the graph of a function.
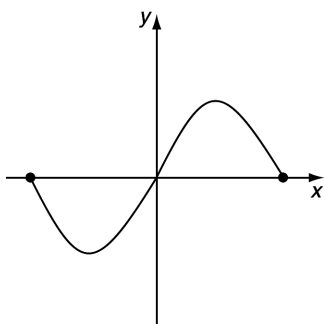
11. _____

11.

12.

12. _____

13. For the following graph of function f, determine
(a) $f(2)$; (b) the domain; (c) all x-values such that
$f(x)=1$; and (d) the range.

13. (a) _____

(b) _____

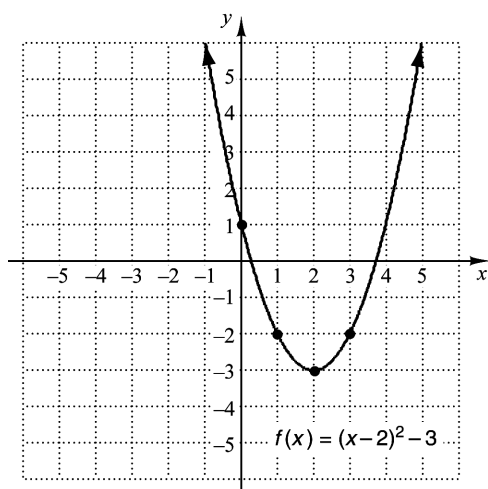**(c)** _____

(d) _____

$f(x) = (x-2)^2 - 3$

14. For the following graph of function f, determine
(a) $f(1)$; (b) the domain; (c) all x-values such that
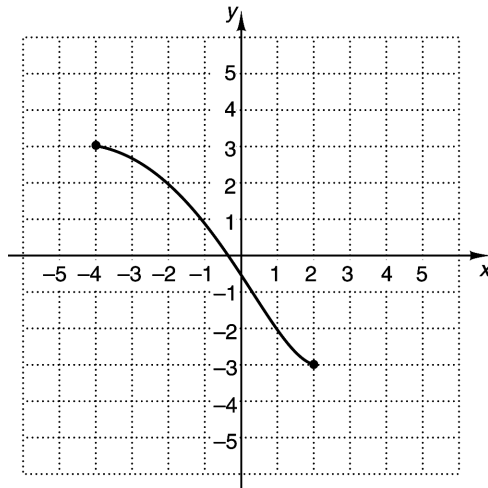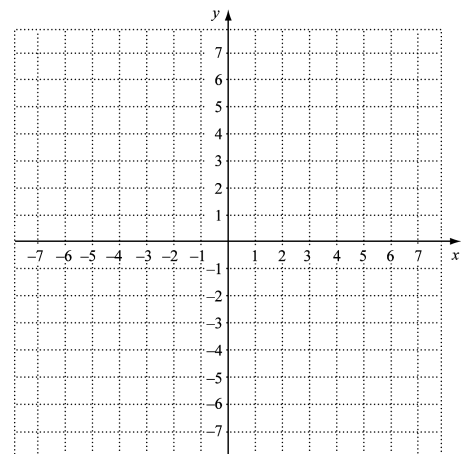$f(x) = 2$; and (d) the range.

14. (a)_____

(b) _____

(c) _____

(d) _____

15. Graph: $f(x) = -\dfrac{2}{x}$.

15.

16. Convert to rational exponents: $\dfrac{3}{\sqrt[4]{n}}$.
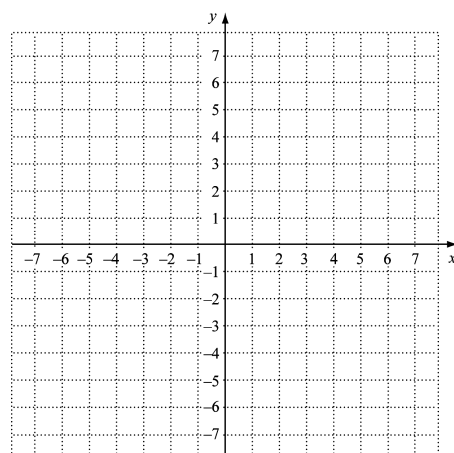
16. _____

17. Convert to radical notation: $y^{-2/3}$.

17. _____

18. Graph: $f(x) = \dfrac{x^2 - 16}{x - 4}$.

18.

Determine the domain of the function.

19. $f(x) = \dfrac{x^2 - 1}{x^2 - 3x - 10}$.

19. _____

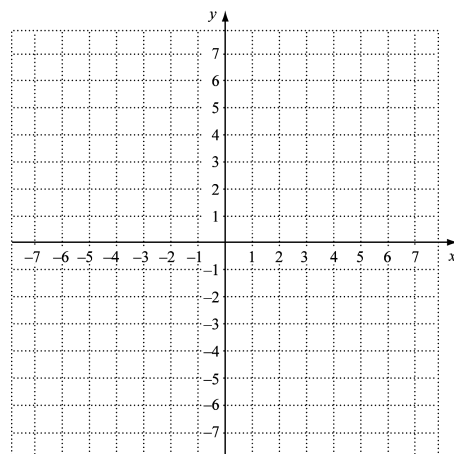**20.** $f(x) = \dfrac{1}{\sqrt{5x + 1}}$.

20. _____

21. Write interval notation for the following graph.

21. _____

22. Graph: $f(x) = \begin{cases} x^2 + 1, \text{ for } x \geq -1 \\ x - 2, \text{ for } x < -1 \end{cases}$.

22.

23. *Number of Full-time Employed Females.* The following table shows the number of females (in thousands) with full-time, year-round earnings.

Years, y, since 2000	Number, n, of females with full-time, year-round earnings
2	41,876
3	41,908
4	42,380
5	43,531
6	44,663
7	45,613
8	44,156

(Source: U.S. Bureau of the Census)

(a) Make a scatterplot of the data.

(b) Do the data appear to fit a quadratic function?

(c) Using the data points (3, 41,908), (7, 45,613) and (8, 44,156), find a quadratic function that fits the data.

(d) Use the function from part (c) to estimate the number of full-time, year-round female earners in 2015.

23. (a)

(b) _____

(c) _____

(d) _____

24. Simplify: $(625^{1/10})^{-5/2}$.

24. _____

25. Write an equation with exactly three solutions: 0, 6, and −5. Answers will vary.

25. _____

26. A function's average rate of change over the interval $[-1, 4]$ is $-\frac{8}{5}$. If $f(-1)=6$, find $f(4)$.

26. _____

27. Graph the function and find the zeros and the domain and range:

$$f(x) = \left| \sqrt[3]{x^2 + 1} \right| - 4.$$

27.

28. *Number of Full-time Employed Females.* Use the data
in Question 23.

   a) Use the REGRESSION feature to fit a quadratic
   function to the data.

   (b) Use the function from part (a) to estimate the number
   of full-time, year-round female earners in 2015.

28. **(a)** _____

   (b) _____

Chapter R, Form E

1. *Business Compound Interest.* A person made an
    investment at 2.7%, compounded annually. It has
    grown to $1899.95 at the end of 1 yr. How much was
    originally invested?

    1. _____

2. A function is given by $f(x) = x^3 - 4$. Find (a) $f(-2)$
    and (b) $f(x+h)$.

    2. (a) _____

        (b) _____

3. What are the slope and the *y*-intercept of $y = -4x + 5$?

    3. _____

4. Find an equation of the line with slope $-\frac{5}{8}$, containing
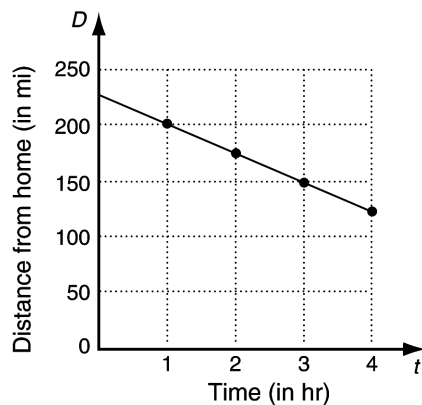   the point (4, 0).

    4. _____

5. Find the slope of the line containing the points (–2, –6)
    and (5, 4).

    5. _____

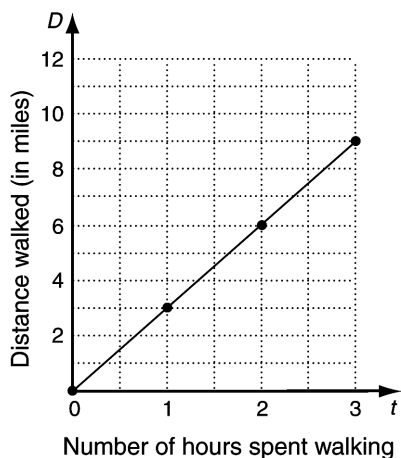Find the average rate of change.

6.

6. _____

7.   7._____

Number of hours spent walking

8. *Currency Conversion.* The amount received in Euros *E*   8. _____
is directly proportional to the amount of U.S. dollars
exchanged, *d.* A traveler converted $1500 into 1260
Euros. Find an equation of variation expressing *E* as a
function of *d.*

9. A camping supplies store is producing new
rechargeable battery lanterns. The fixed costs for the
first year are $27,750. The variable costs are $9 per
lantern. The revenue from each lantern is $18.25.

(a) Formulate a function *C(x)* for the total cost of   9. (a) _____
producing *x* rechargeable battery lanterns.

(b) Formulate a function *R (x)* for the total revenue   (b) _____
from the sale of *x* rechargeable battery lanterns.

(c) Formulate a function *P(x)* for the total profit from   (c) _____
the production and sale of *x* lanterns.

(d) How many lanterns must the manufacturer sell in   (d) _____
order to break even?

10. *Economics: equilibrium point.* Find the equilibrium   10. _____
point for the demand and supply functions:
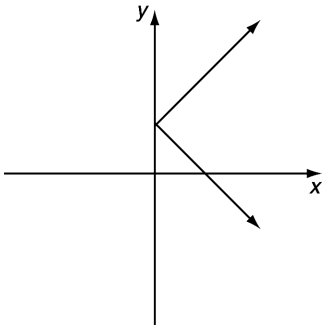
$$\text{Demand: } q = (x-5)^2, \ 0 \le x \le 5,$$
$$\text{Supply: } q = x^2 + 2x + 7,$$

given that *x* is the unit price, in dollars, and *q* is the
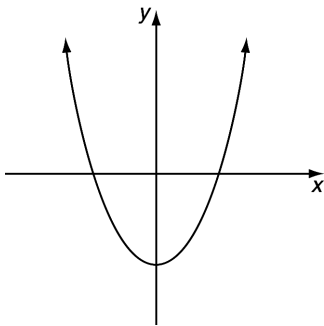quantity demanded or supplied, in thousands.

Use the vertical-line test to determine whether each of the following is the graph of a function.
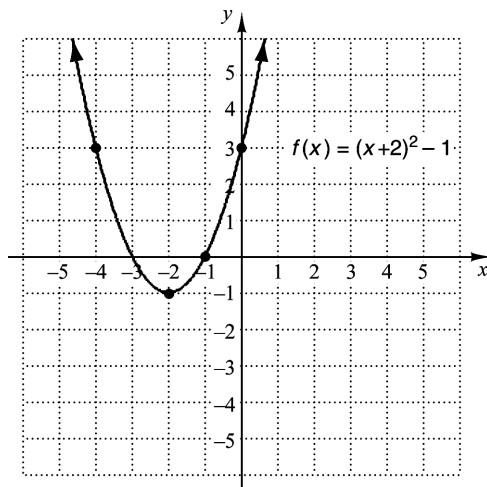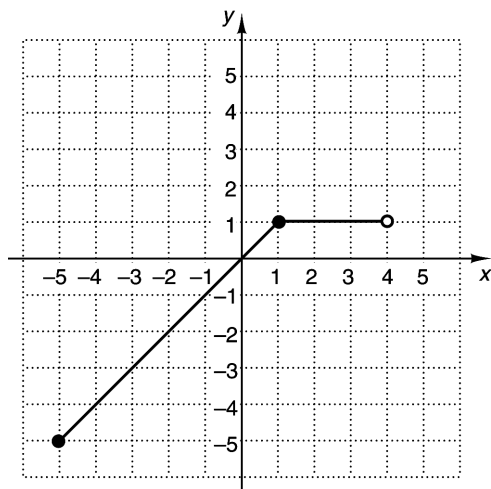
11.

11. _____

12.

12. _____

13. For the following graph of function f, determine
(a) $f(-2)$; (b) the domain; (c) all x-values such that $f(x) = 3$; and (d) the range.

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

13. (a)_____
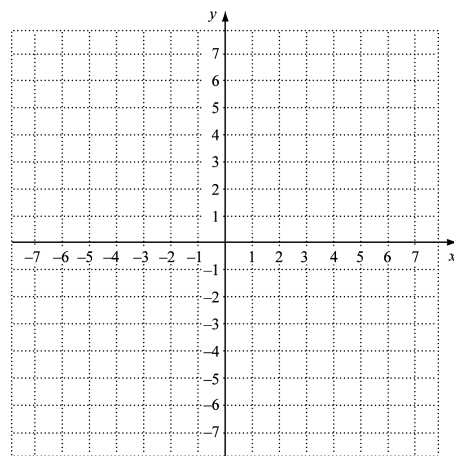
(b) _____

(c) _____

(d) _____

14. For the following graph of function f, determine
(a) $f(-2)$; (b) the domain; (c) all x-values such that
$f(x) = 1$; and (d) the range.

14. (a) _____

(b) _____

(c) _____

(d) _____

15. Graph: $f(x) = \dfrac{6}{x-3}$.

15.

16. Convert to rational exponents: $\dfrac{5}{\sqrt[3]{n^2}}$.
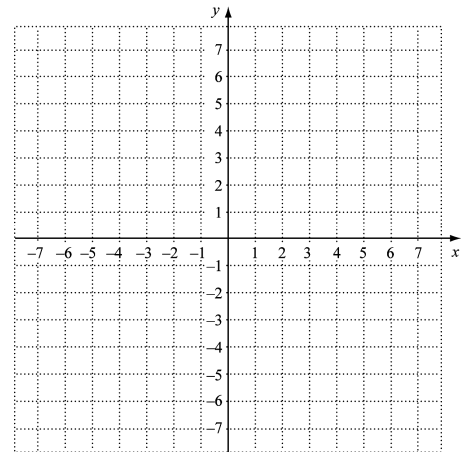
16. _____

17. Convert to radical notation: $y^{3/4}$.

17. _____

18. Graph: $f(x) = \dfrac{x^2 + 2x - 8}{x + 4}$.

18.

Determine the domain of the function.

19. $f(x) = \dfrac{x^2 - x}{x^2 - x - 6}$.

19. _____

20. $f(x) = \sqrt{x + 6}$.
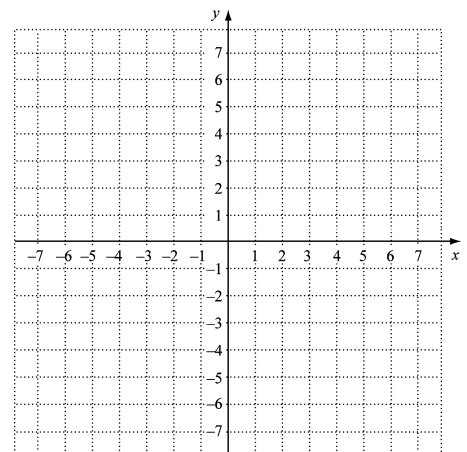
20. _____

21. Write interval notation for the following graph.

21. _____

22. Graph: $f(x) = \begin{cases} x^2 - 3, \text{ for } x \geq 0 \\ -2x, \text{ for } < 0 \end{cases}$.

22.

23. *Height and Distance of Shot-put Throw.* The following table shows the height h in feet of the ball at the instant the ball has traveled d feet horizontally.

Distance, d	Height, h
35	36
60	58
80	69
100	76
120	82
140	82
160	79
180	76
200	68

(a) Make a scatterplot of the data.

(b) Do the data appear to fit a quadratic function?

(c) Use the data points (60, 58), (140, 82) and (200, 68), find a quadratic function that fits the data.

(d) Use the function from part (c) to estimate the height of the ball when it is 155 feet from the starting point.

23. (a)

(b) _____

(c) _____

(d) _____

---

24. Simplify: $(81^{3/2})^{-1/3}$.

24. _____

25. Write an equation with, exactly three solutions; 2, –4, and 6. Answers will vary.
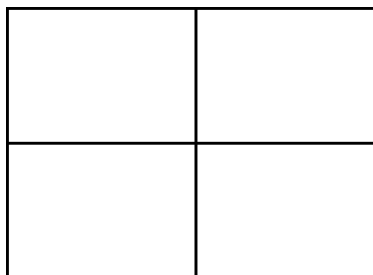
25. _____

26. A function's average rate of change over the interval $[2, 9]$ is $-\frac{5}{7}$. If $f(2)=11$, find $f(9)$.

26. _____

---

27. Graph the function and find the zeros and the domain and range:

$$f(x)=\left|\sqrt[3]{2-x^2}\right|-2.$$

27.

28. *Height and Distance of Shot-put Throw.* Use the data in Question 23.

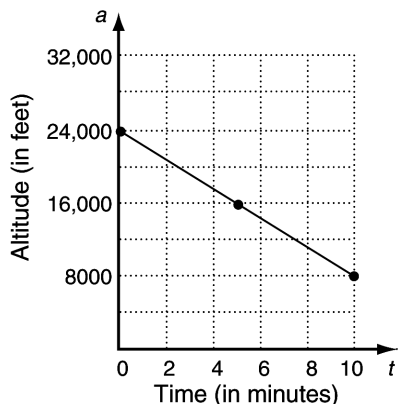   **(a)** Use the REGRESSION feature to fit a quadratic function to the data.

    (b) Use the function from part (a) to estimate the height of the ball when it is 155 feet from the starting point.
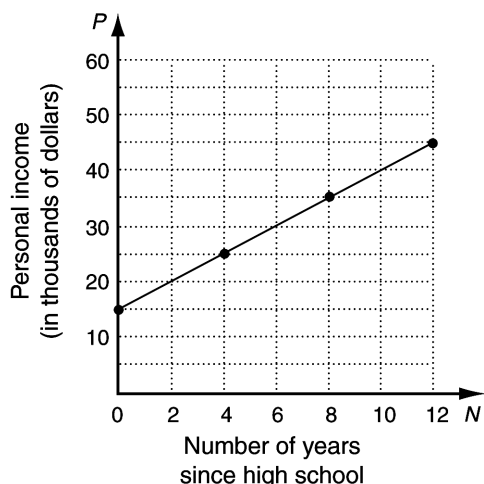
28. (a) _____

     (b) _____

Chapter R, Form F

1. *Business: compound interest.* A person made an investment at 3.8%, compound annually. It has grown to $1245.60 at the end of 1 yr. How much was originally invested?

   1. _____

2. A function is given by $f(x) = 3x^2 - 5$. Find (a) $f(-7)$ and (b) $f(x+1)$.

   2. (a) _____

   (b) _____

3. What are the slope and the *y*-intercept of $y = \frac{1}{2}x - 6$?

   3. _____

4. Find an equation of the line with slope $-\frac{1}{4}$, containing the point $(2, -8)$.

   4. _____

5. Find the slope of the line containing the points $(10, 7)$ and $(-2, 3)$.

   5. _____

6. Find the average rate of change.

   6. _____

7.

7._____

8. *Weight on Mars.* The weight M of an object on Mars is directly proportional to its weight E on earth. A person who weights 126 lb on earth weights 42 lb on Mars. Find an equation of variation expressing E as a function of M.

8. _____

9. An office furniture manufacturer is planning on producing new, ergo-dynamic chairs. For the first year, the fixed are $10,390. The variable costs are $78 for each chair produced. The revenue from each chair is expected to be $129.95.

   (a) Formulate a function $C(x)$ for the total cost of producing x ergo-dynamic chairs.

9. **(a)** _____

   (b) Formulate a function $R(x)$ for the total revenue from the sale of x ergo-dynamic chairs.

   (b) _____

   (c) Formulate a function $P(x)$ for the total profit from the production and sale of x ergo-dynamic chairs.

   (c) _____

   (d) How many of these chairs must the manufacturer sell in order to break even?

   (d) _____

10. Economics: *equilibrium point*. Find the equilibrium point for the demand and supply functions:

10. _____

$$\text{Demand: } q = (x-6)^2,\ 0 \le x \le 6,$$
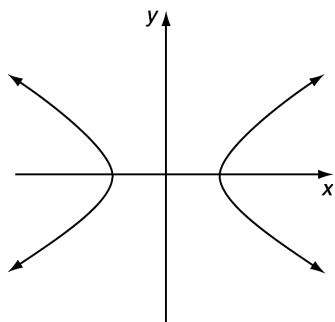
$$\text{Supply: } q = \frac{4}{9}x^2,$$

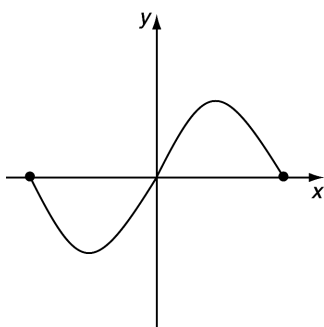given that x is the unit price, in dollars, and q is the quantity demanded or supplied, in thousand.

Use the vertical-line test to determine whether each of the
following is the graph of a function.

11. _____
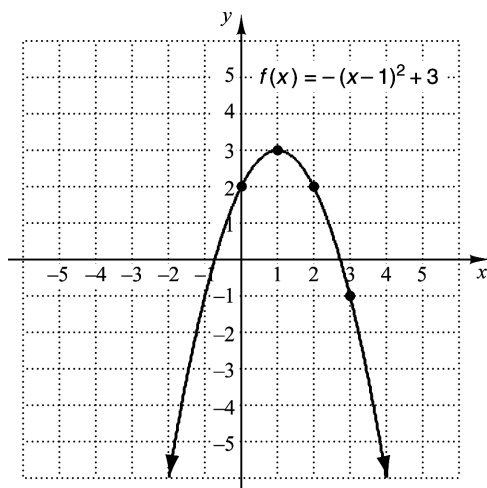
11.

12.

12. _____

13. For the following graph of function f, determine
(a) $f(3)$; (b) the domain; (c) all x-values such that
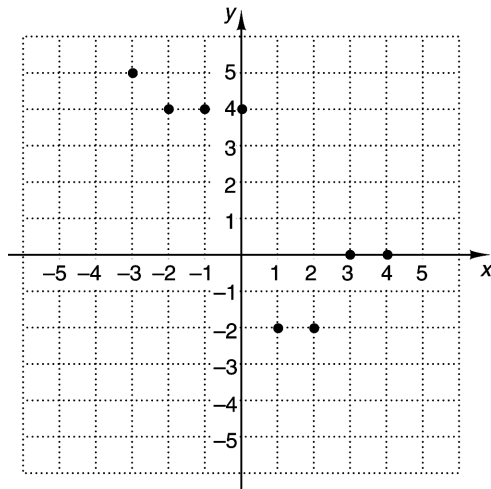$f(x) = 2$; and (d) the range.

13. (a) _____

(b) _____

(c) _____

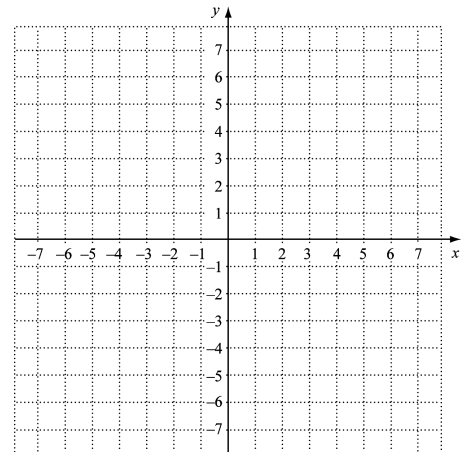**(d)** _____

$f(x) = -(x-1)^2 + 3$

14. For the following graph of function f, determine
(a) $f(-2)$; (b) the domain; (c) all x-values such that
$f(x) = 4$; and (d) the range.

14. (a) _____

(b) _____

(c) _____

(d) _____

15. Graph: $f(x) = \dfrac{4}{x-4}$.

15.

16. Convert to rational exponents: $\dfrac{3}{\sqrt{x}}$.
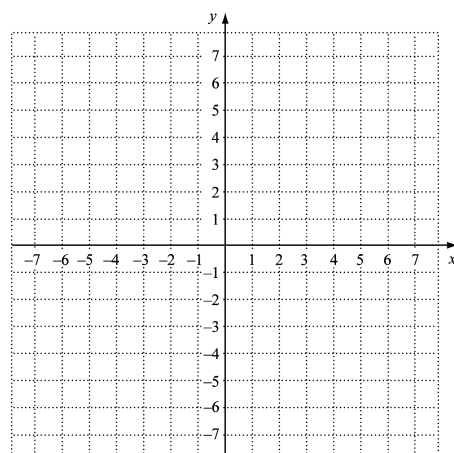
16. _____

17. Convert to radical notation: $y^{-5/9}$.

17. _____

18. Graph: $f(x) = \dfrac{x^2 - x - 6}{x + 2}$.

18.

Determine the domain of the function.

19. $f(x) = \dfrac{x^2 - 3}{x^2 - x - 12}$.

19. _____

20. $f(x) = \dfrac{1}{\sqrt{x - 8}}$.
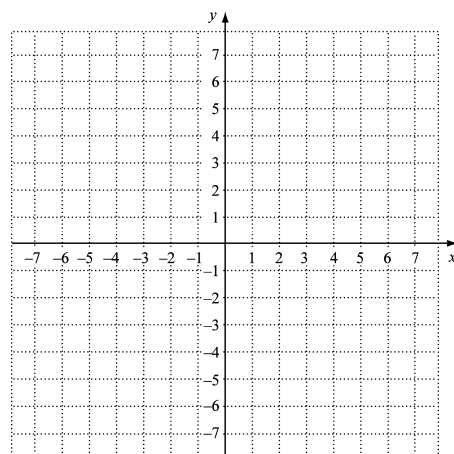
20. _____

21. Write interval notation for the following graph.

21. _____

22. Graph: $f(x) = \begin{cases} x^2 + 1, & \text{for } x > 0 \\ x - 2, & \text{for } x \le 0 \end{cases}$.

22.

23. *MLB Salary History.* The following table shows the average *MLB* player salaries by year from 1970 to 2010.

Years, y, since 1970	Average *MLB* player salary, s, in thousands
0	29
5	45
10	144
15	372
20	579
25	1,071
30	1,998
35	2,477
40	3,340

http://www.baseball-almanac.com/charts/salary/major_league_salaries..shtml

(a) Make a scatterplot of the data.

(b) Do the data appear to fit a quadratic function?

(c) Use the data points (5, 45), (25, 1071) and (40, 3340), find a quadratic function that fits the data.

(d) Use the function from part (c) to estimate the average *MLB* player salary in 2020, which is 50 years after 1970.

23. (a)

(b) _____

(c) _____

(d) _____

---

24. Simplify: $(81^{3/4})^{-1/3}$.

24. _____

25. Write an equation with exactly three solutions: −1, 4, and −2. Answers will vary.

25. _____

26. A function's average rate of change over the interval [-1, 3] is $\frac{5}{4}$. If $f(-1) = 9$, find $f(3)$.

26. _____

27. Graph the function and find the zeros and the domain and range:

$$f(x) = \sqrt[3]{\left|10 - x^2\right|} - 4.$$

27.

28. *MLB Salary History*. Use the data in Question 23.

    (a) Use the REGRESSION feature to fit a quadratic
        function to the data.

    (b) Use the function from part (a) to estimate the
        average MLB player salary in 2020, which is 50
        years after 1970

28. (a) _____

     (b) _____