Determine whether or not the relationship shown in the table is a function. Why or why not?

1)

x	−6	−6	1	4	8
y	5	4	6	3	8

Does the table define x as a function of y?

State whether the graph is or is not that of a function. Why or why not?
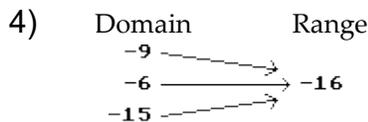
2)
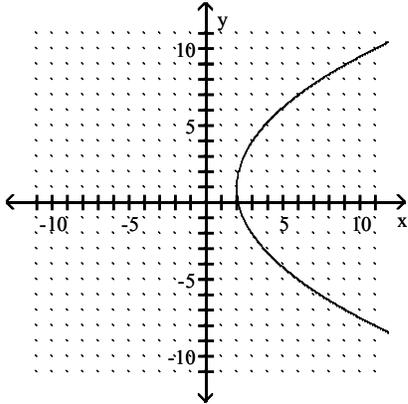
Decide whether or not the set of ordered pairs defines a function. Why or why not?

3) {(−3, −5), (−1, 2), (2, −3), (7, 2)}

Decide whether or not the arrow diagram defines a function. Why or why not?

4)

Find the domain of the function.

5) $y = \dfrac{17}{12 - x}$
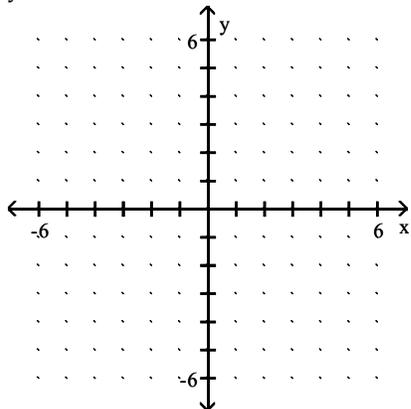
State the domain of the function in the given context.

6) Suppose that the cost C (in dollars) of removing p% of the particulate pollution from the smokestack of a power plant is given by $C(p) = \dfrac{237{,}000p}{100 - p}$

Find the slope of the line through the pair of points.
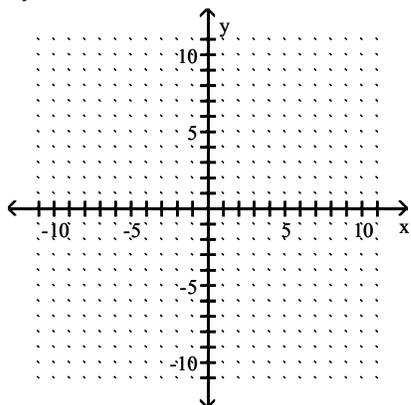
7) (7, −3) and (−5, 6)

Graph the function with a graphing utility.

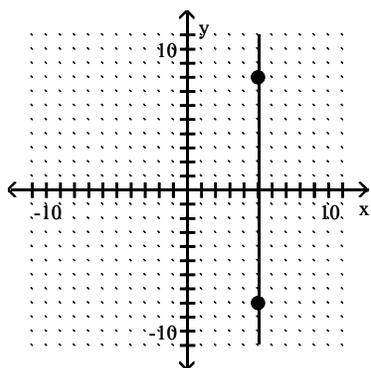8) $y = x^3 + x^2 + 2x - 1$

Find the x– and y–intercepts of the graph of the given equation, if they exist. Then graph the equation.

9) $4y = -24 + 6x$

Decide whether the slope is positive, negative, zero, or undefined.

10)

A) Positive   B) Negative   C) Undefined   D) Zero

Solve the problem.
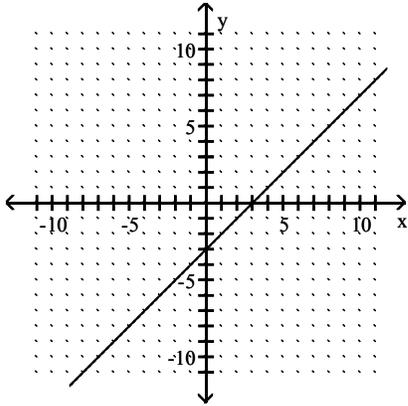
11) The cost of a rental car for the weekend is given by the function $C(x) = 146 + 0.25x$, where x is the number of miles driven. Find the slope of the graph of this function and interpret it as a rate of change.

2

Write the slope–intercept form of the equation for the line passing through the given pair of points.

12) (–5, –3) and (–1, –6)

Write the equation of the line whose graph is shown.

13)

Solve the problem.

14) Using a phone card to make a long distance call costs a flat fee of $0.81 plus $0.16 per minute starting with the first minute. Find the total cost of a phone call which lasts 27 minutes.

Solve the equation.

15) $-3x + 4(-2x - 7) = -31 - 8x$

Solve the problem.

16) A repair company's charge for repairing a certain type of copy machine fits the model $y = 47.38 + 0.617x$ where y is the number of dollars charged and x is the number of minutes the repair person is on the job. How many minutes would it take for the cost of repair to reach $120? (Round to the nearest minute.)

Use the data shown in the scatter plot to determine whether the data should be modeled by a linear function.

17)
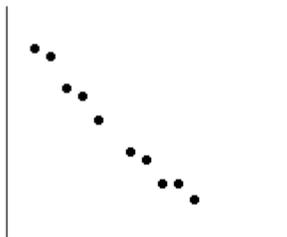
A) Yes, approximately linear
B) No, data points do not lie close to a line
C) Yes, exactly linear

Determine whether the following data set is exactly linear, approximately linear or nonlinear.

18)

Height (inches)	57	60	72	59	63	65	66	68	61
Time (seconds)	32.9	40.1	35.7	41.8	47.4	37.3	39.1	41.5	32.8

Solve the problem.

19) The paired data below consist of the costs of advertising (in thousands of dollars) and the number of products sold (in thousands). The linear model for this data is y = 55.8 + 2.79x, where x is the cost of advertising (in thousands of dollars) and y is number of products sold (in thousands). Use this model to predict the number of products sold (in thousands) if the cost of advertising is $8000.

Cost	9	2	3	4	2	5	9	10
Number	85	52	55	68	67	86	83	73

Find the number of units that gives break–even for the product. Round your answer to the nearest whole unit.

20) A manufacturer has total revenue given by the function R = 258x and has total cost given by C = 26x + 974,000, where x is the number of units produced and sold.

Solve the problem.

21) The demand for a certain product is given by p + 8q = 297, and the supply is given by p – 4q = 21, where p is the price in dollars and q is the quantity demanded or supplied at price p. Find the price at which the quantity demanded equals the quantity supplied.

22) Suppose that the number of inhabitants of Country A is given by y = −7.33x + 909.51 million, and the number of inhabitants of Country B is given by y = 2.07x + 815.51 million, where x is the number of years since 2010. Find the year in which the number of inhabitants of Country A equals the number of inhabitants of Country B.

Solve the system of equations by substitution, if a solution exists.

23) $\begin{cases} x + 2y = 16 \\ 2x + 3y = 24 \end{cases}$

Solve the system of equations by elimination, if a solution exists.

24) $\begin{cases} 6x - 3y = -5 \\ 18x - 9y = 15 \end{cases}$

Solve the inequality. Write the solution set in interval notation.

25) $-2(4y - 7) + y \geq 2y - (-8 + y)$

**Solve the double inequality.**

26) $-28 \leq -4c + 4 < -4$

Solve.

27) Suppose that the sales of a particular brand of appliance satisfy the relationship S(x) = 120x + 1600, where S(x) represents the number of sales in year x, with x = 0 corresponding to 1990. For what years will sales be between 1960 and 2320?

4

Solve the problem.

28) During the first four months of the year, Jack earned $1180, $1170, $1460 and $1050. If Jack must have an average salary of at least $1180 in order to earn retirement benefits, what must Jack earn in the fifth month in order to qualify for benefits?

Solve the inequality graphically. Give the solution in interval notation.

29) Use the intersection method to solve $13x - 4 \leq 12x - 2$.
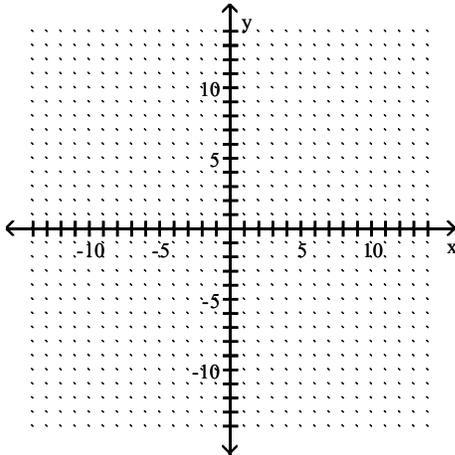
Determine if the graph of the function is concave up or concave down. Explain why.
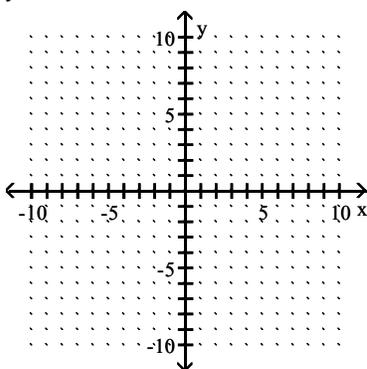
30) $y = -x^2 + 1$

Determine if the vertex of the graph is a maximum point or a minimum point. Explain why.
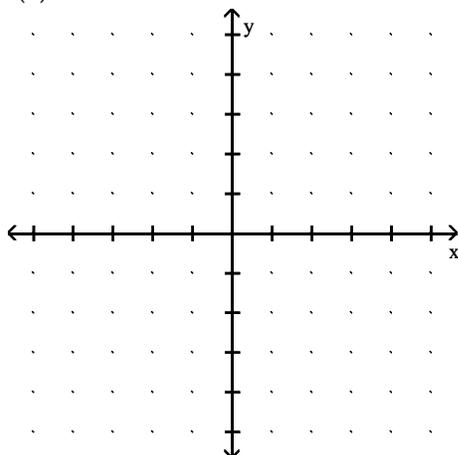
31) $f(x) = 3x^2 + 2x + 2$

Give the coordinates of the vertex and graph the equation in a window that includes the vertex.

32) $y = -x^2 - 4x - 3$

5

Use the graph of the function to estimate the x–intercepts.

33) $f(x) = 4x^2 - 19x - 5$

Solve the problem.

34) The manager of big box store has found that if the price of a pillow is $p(x) = 95 - \frac{x}{8}$, then x pillows will be sold. The expression for the total revenue from the sale of x pillows is $R(x) = 95x - \frac{x^2}{8}$. Find the number of pillows that will produce maximum revenue.

35) Given the following revenue and cost functions, find the maximum profit.
$$R(x) = 60x - 2x^2; \quad C(x) = 20x + 104$$

36) The daily profit for a product is given by $P = 36x - 0.02x^2 - 1600$, where x is the number of units produced and sold.
a. Graph this function for x between 0 and 2100.
b. Describe what happens to the profit of this product when the number of units produced is between 1 and 900. What happens after 900 units are produced?
c. Is the graph of this function concave up or down?

37) The number of students receiving a diploma from a local high school for the years 2000 through 2035 can be projected by the function $y = -0.275x^2 + 6.05x + 260$, where x is the number of years after 2000.
a. Is the vertex of the graph of this function a maximum or a minimum?
b. Find the input and output at the vertex. Round to the nearest tenth when appropriate.

Use factoring to solve the equation.

38) $4x^2 - 24x + 32 = 0$

Use the square root method to solve the equation.

39) $7z^2 + 2 = 849$

Use the quadratic formula to solve the equation.

40) $4m^2 + 12m + 4 = 0$

Solve the problem.

41) The following points form a quadratic relationship: (1, 5.0), (2, 4.4), (3, 4.3), (4, 4.2), (5, 4.6), (6, 4.8), (7, 5.4), (8, 6.2) . The x–coordinates are the years a particular company has been in operation and the y–coordinates are the profit, in millions, for that year. Find the quadratic function that models the profit in millions as a function of x, the number of years of operation. Round to three decimal places.

42) The table lists the amount of emissions of a certain pollutant in millions of tons.

Year	1980	1985	1990	1995
P	18.8	22.6	26.0	29.0

If the amount of emissions is modeled by a function of the form $f(x) = ax^2 + bx + c$ where x is the year, estimate the amount of emissions in the year 2025.

43) The percent of people who say they plan to stay in the same job position until they retire has decreased over recent years, as shown in the table below.

Year	2005	2006	2007	2008	2009	2010
Percent	42	38	35	34	30	26

Find a power function that models the data in the table using an input equal to the number of years from : According to the unrounded model, in what year will only 23% of people plan to stay in the same job posi until retirement?

Determine if the function is a growth exponential or a decay exponential.
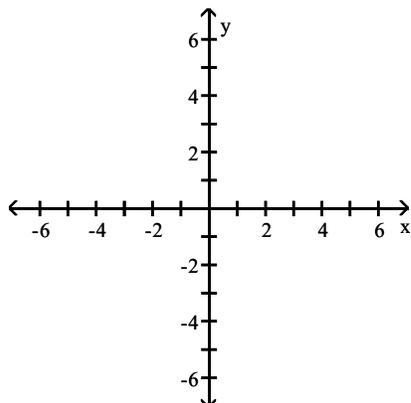
44) $y = 9e^{-9x}$

    A) Growth   B) Decay

Graph the function.

45) $f(x) = 4^{(x-1)} - 1$

Solve the problem.

46) The population of a small country increases according to the function $B = 2{,}500{,}000e^{0.02t}$, where t is measured in years. How many people will the country have after 3 years?

Write the logarithmic equation in exponential form.

47) $\log_{14} 1 = 0$

Write in logarithmic form.

48) $4^2 = 16$

Use a change of base formula to evaluate the given logarithm. Approximate to three decimal places.

49) $\log_6 (16.58)$

Solve the equation.

50) $4^x = 19$ Round to three decimal places.

51) $2^{(x-3)} = 17$ Round to three decimal places.

52) $2e^{(3x+6)} = 10$ Round to three decimal places.

Solve the problem.

53) The number of visitors to a tourist attraction (for the first few years after its opening) can be approximated by $V(x) = 50 + 10 \log_2 x$, where x represents the number of months after the opening of the attraction. Find the number of visitors 32 months after the opening of the attraction.

54) If $4900 is invested in an account earning 7% annual interest compounded continuously, then the number of years that it takes for the amount to grow to $9800 is $n = \dfrac{\ln 2}{0.07}$. Find the number of years to the nearest tenth of a year.

55) What will be the amount in an account with initial principal $9000 if interest is compounded continuously at an annual rate of 7.25% for 7 years?

56) How long would it take $5000 to grow to $25,000 at 9% compounded continuously? Round your answer to the nearest tenth of a year.

Solve the equation. Give an exact solution.

57) $5 \ln x = 8$

58) $\log_5 x = 3$

59) $\log(x + 20) = 1$

Solve the problem.

60) The consumption of electricity can be modeled by $C = Ae^{rt}$, where A is the current use, r is the rate at which the use is increasing, and t is the number of years. Suppose the consumption of electricity grows at 6.8% per year. Find the number of years before the use of electricity has tripled. Round the answer to the nearest hundredth.

61) If $1000 is invested at the end of each year in an annuity that pays 8%, compounded annually, the number of years it takes for the future value to amount to $22,000 is given by $t = \log_{1.08} 177$. Use the change of base formula to find the number of years until the future value is $22,000, to the nearest tenth of a year.

62) Find the exponential function that models the data in the table below.

x	f(x)
−2	22
−1	15.4
0	10.78
1	7.546
2	5.2822

63) Find the logarithmic function that models the data in the table below.

x	1	2	3	4	5
y	1.3	4.9	6.8	8.0	9.2

64) Find an exponential function that models the data below and use it to predict about how many books will have been read in the eighth grade.

| Grade	Number of Books Read
2	9
3	27
4	67
5	121

65) Wind speed varies in the first twenty meters above the ground. For a particular day, let $f(x) = 9.8 \ln x + 3.3$ model the wind speed x meters above the ground. At what height is the wind speed 9 meters per second? Round results to the nearest hundredth.
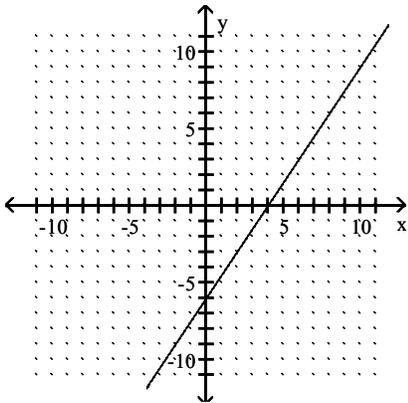
1) No, the x value of –6 is repeated with different y–values
2) No, it fails the vertical line test
3) Yes, each x–value is assigned exactly one y–value.
4) Yes, each value of the domain is assigned exactly one value from the range.
5) All real numbers except 12
6) $0 \le p < 100$
7) $-\dfrac{3}{4}$
8)
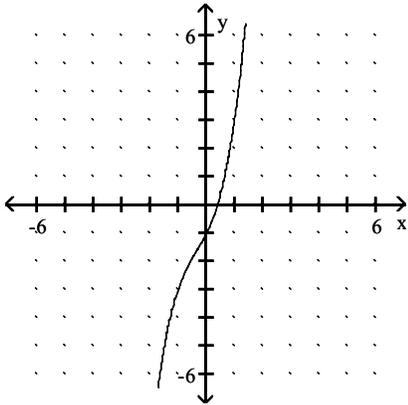
9) x: 4; y: –6

10) C
11) 0.25; The cost of the rental car increases by $0.25 for each mile driven.
12) $y = -\dfrac{3}{4}x - \dfrac{27}{4}$
13) $y = x - 3$
14) $5.13
15) 1
16) 118 min
17) A
18) nonlinear
19) 78,120 products sold
20) 4198 units
21) $113

22) 2020
23) $x = 0, y = 8$
24) No solution
25) $\left(-\infty, \dfrac{3}{4}\right]$
26) $2 < c \le 8$
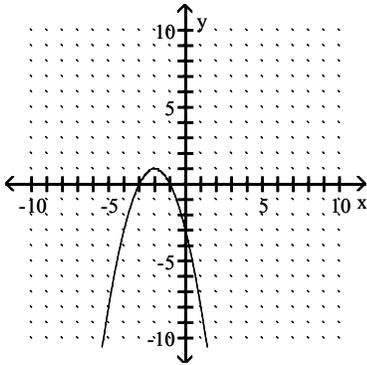27) Between 1993 and 1996
28) at least $1040
29) $(-\infty, 2]$
30) Concave down because $a < 0$
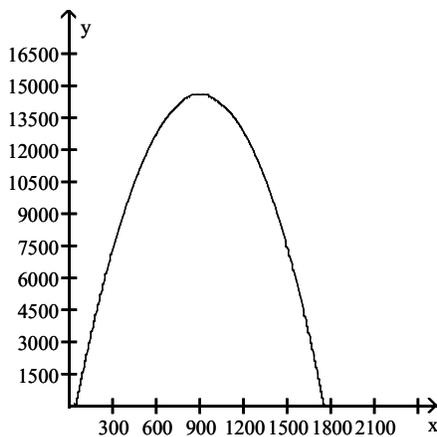31) Minimum because $a > 0$
32) Vertex: $(-2, 1)$

33) $x = -0.25, x = 5$
34) 380 pillows
35) $96
36) a.

b. The profit increases.; The profit decreases.
c. The graph is concave down.
37) a. maximum
b. (11, 293.3)
38) 2, 4
39) ±11

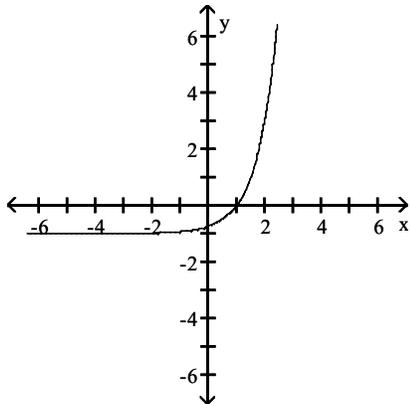40) $\dfrac{-3 \pm \sqrt{5}}{2}$

41) $y = 0.101x^2 - 0.723x + 5.552$

42) 38.6 million tons

43) 2013

44) B

45)

46) 2,654,591

47) $14^0 = 1$

48) $\log_4 16 = 2$

49) 1.567

50) 2.124

51) 7.087

52) −1.464

53) 100 visitors

54) 9.9 yr

55) $14,950.20

56) 17.9 years

57) $e^{8/5}$

58) 125

59) −10

60) 16.16 years

61) 67.3 years

62) $f(x) = 10.78 \cdot 0.7^x$

63) $f(x) = 1.39 + 4.86 \ln x$

64) 1883 books

65) 1.79 m