

Math 120 Final Exam Review

Select from the list of numbers all that belong to the specified set.

1) Rational numbers

$$9, \sqrt{6}, -20, 0, \frac{0}{2}, \sqrt{16}, \frac{-4}{0}, 0.09$$

A) $9, -20, 0, \frac{0}{2}, \sqrt{16}, 0.09$

B) $\sqrt{6}, \sqrt{16}$

Find the percent change if a quantity changes from P_1 to P_2 . Round your answer to the nearest tenth if appropriate.

2) $P_1 = \$13, P_2 = \51

Solve the problem.

3) A comet has a nearly circular orbit around a star with a radius of 347 million miles and requires 7.86 earth years to complete one orbit. Estimate the orbital speed of the comet in miles per hour. Round to the nearest mile per hour.

Find the domain and range of the relation.

4) $\{(-4, -7), (-2, -5), (-6, -8), (-6, -4)\}$

A) $D = \{-6, -2, -4, 6\}; R = \{-8, -5, -7, -4\}$

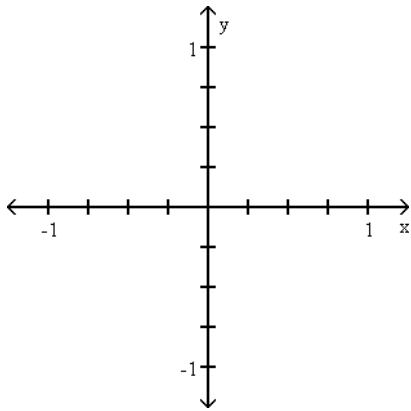
B) $D = \{-6, -2, -4, -6\}; R = \{-8, -5, -7, -4\}$

C) $D = \{-6, -2, -4\}; R = \{-8, -5, -7, -4\}$

D) $D = \{-8, -5, -7, -4\}; R = \{-6, -2, -4\}$

Make a scatterplot of the relation.

5) $\{(0.29, 0.47), (0.34, 0.31), (0.47, -0.09), (0.28, 0.13), (0.05, -0.67), (0.37, 0.94), (0.62, 0.5), (0.25, 0.09)\}$



Make a line graph of the data.

6) The following table shows the average tuition for one semester at City X College over various years. Use time on the horizontal scale for your line graph.

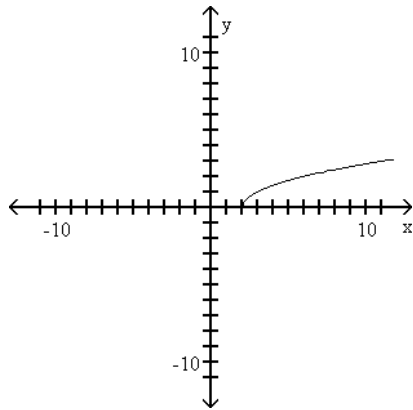
Year	Average College Tuition
1980	\$1000
1981	1500
1982	2500
1983	3500

Evaluate the function as indicated.

7) Find $f(7)$ when $f(x) = \sqrt{4x + 2}$.

Find the domain and the range for the function.

8)

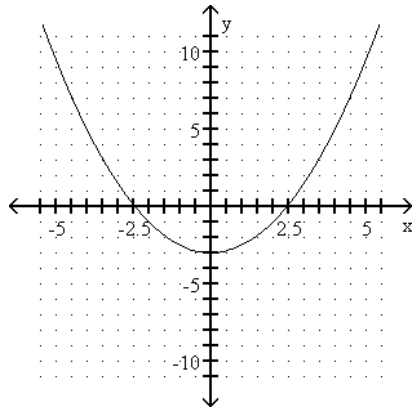


- A) $D: \{x|x > 2\}$, $R: \{y|y \geq 0\}$
C) $D: \{x|x \geq 2\}$, $R: \{y|y \geq 0\}$

- B) $D: \{x|x \geq 0\}$, $R: \{y|y \leq 0\}$
D) $D: \{x|x > 0\}$, $R: \{y|y < 0\}$

Use the graph to estimate the function value.

9) $f(1)$



A) -2.5

B) -3

C) 3.5

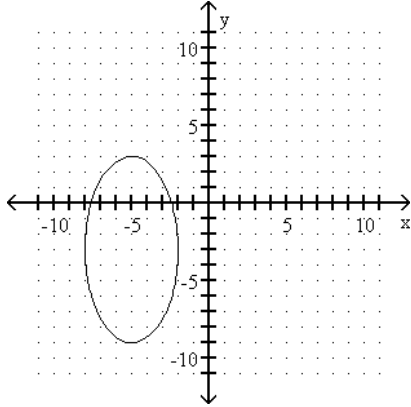
D) 1

For the given function expressed verbally, give a symbolic representation.

- 10) Bob buys a car that gets 8 miles per gallon of gasoline. Give a representation to compute the number of miles, y , that Bob can travel with x gallons of gasoline. Let $y = f(x)$.

Determine if the relation is a function.

11)



A) Function

B) Not a function

Find the slope of the line that goes through the pair of points.

12) (2, -8) and (-4, 4)

Determine if the data in the table is linear or nonlinear.

13)

x	-4	-2	0	2	4
y	18	6	2	6	18

A) Linear

B) Nonlinear

Solve the problem.

14) The table gives the outside temperature in degrees Fahrenheit on a winter day in Death Valley, California.

Time (A.M.)	7:00	8:00	9:00	10:00	11:00
Temp.	70	71	77	83	87

Calculate the average rate of change in temperature between 8:00 am and 11:00 am. Round your answer to two decimal places.

Find the difference quotient for the function and simplify it.

15) $f(x) = x^2 - 4x$

Determine whether f models the data exactly or approximately.

16) $f(x) = 3.9x - 5.3$

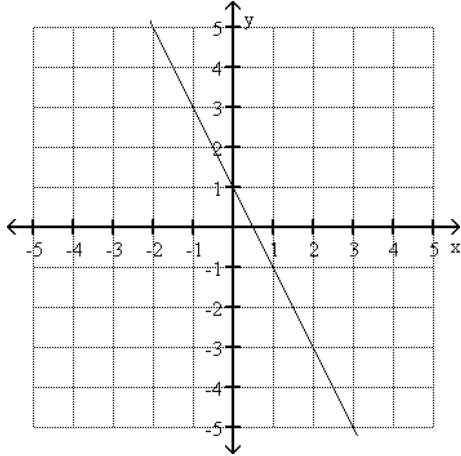
x	1	2	3	4
y	-1.4	2.6	6.3	10.4

A) Approximately

B) Exactly

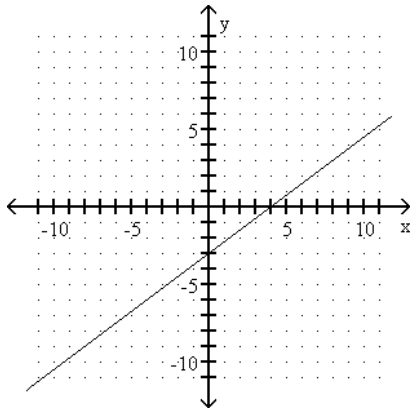
Identify the slope, y-intercept, and x-intercept.

17)



Write the equation of the line whose graph is shown.

18)



A) $y = \frac{3}{4}x - 3$

B) $y = 4x - 3$

C) $y = \frac{4}{3}x + 4$

D) $y = -4x - 3$

Solve the problem.

- 19) The cost for labor associated with fixing a washing machine is computed as follows: There is a fixed charge of \$30 for the repairman to come to the house, to which a charge of \$26 per hour is added. Find an equation that can be used to determine the labor cost, $C(x)$, of a repair that takes x hours.

Solve the problem using your calculator.

- 20) The paired data below consist of the test scores of 6 randomly selected students and the number of hours they studied for the test. Use linear regression to find a linear function that predicts a student's score as a function of the number of hours he or she studied.

Hours	5	10	4	6	10	9
Score	64	86	69	86	59	87

Write an equation of the line through the given point with the given slope. Write the equation in slope-intercept form.

21) $(3, 2)$; $m = -\frac{5}{6}$

22) $(-8, 6)$; horizontal

Find a point-slope form for the equation of the line satisfying the conditions.

23) Passing through $(-7, -2)$ and $(-1, -5)$

A) $y = 2(x - \frac{1}{2}) + 7$

B) $y = \frac{1}{2}(x - 7) + 2$

C) $y = -\frac{1}{2}(x + 7) - 2$

D) $y = -2(x + \frac{1}{2}) - 7$

Determine the equation of the line described. Put answer in the slope-intercept form, if possible.

24) Through $(-4, -5)$, perpendicular to $9x + 4y = -56$

A) $y = \frac{4}{9}x$

B) $y = -\frac{4}{9}x + \frac{29}{9}$

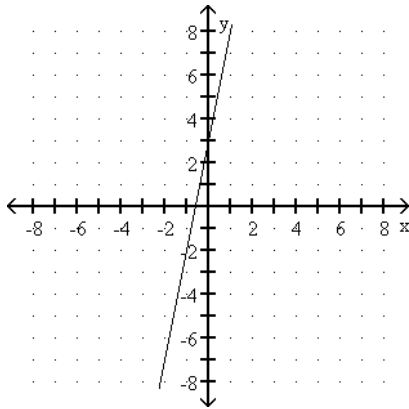
C) $y = \frac{4}{9}x - \frac{29}{9}$

D) $y = \frac{9}{4}x + 29$

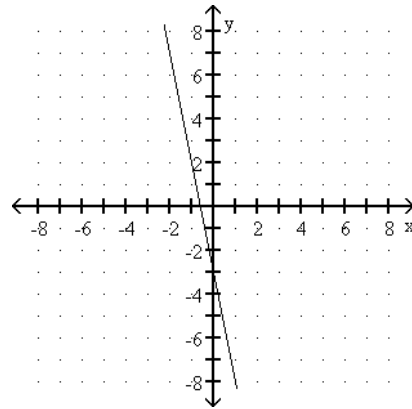
Match the equation to its graph.

25) $y = -5x + 3$

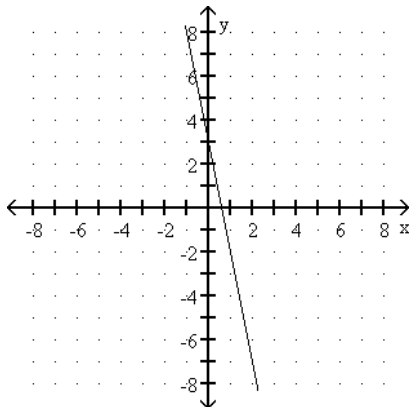
A)



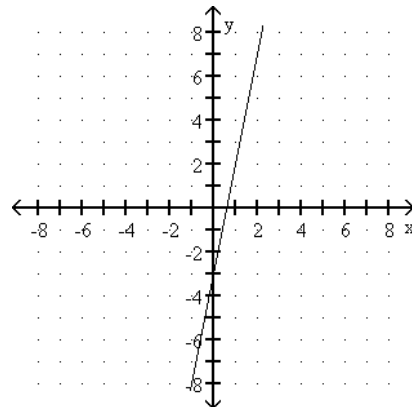
B)



C)



D)

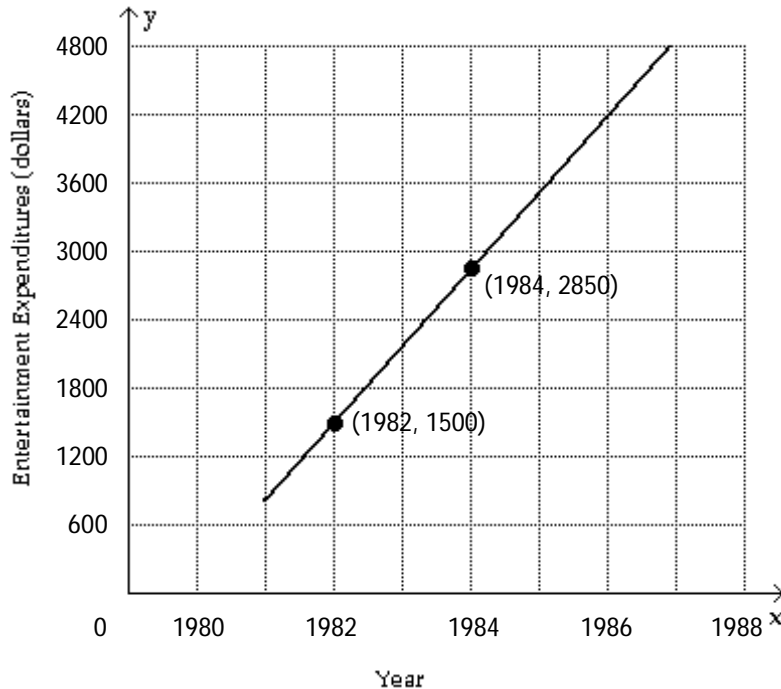


Determine symbolically the x- and y-intercepts on the graph of the equation.

26) $y = 7.2x - 576$

Solve the problem.

27)



The graph models the average amount spent annually on entertainment per household in Country X from 1981 to 1987. (i) Find the slope of the line. (ii) Find a point-slope form for the line. (Answers may vary.)

Solve.

28) Interpret the slope of the line in problem #27.

Solve the equation symbolically.

29) $\frac{2x - 4}{5} + \frac{8x + 6}{5} = -4$

Solve the linear equation with the intersection-of-graphs method. Approximate the solution to the nearest hundredth if necessary.

30) $-1.1(x - 7) = \frac{1}{5}x - 3.1$

A) 8.31

B) -3.54

C) -5.11

D) 12

Solve the problem. Round your answer to the nearest whole number.

31) A tree casts a shadow 22 m long. At the same time, the shadow cast by a 48-cm tall statue is 71 cm long. Find the height of the tree.

Solve the problem.

32) A store is discounting all regularly priced items by 25%. (i) Find a function f that computes the sale price of an item having a regular price of x . (ii) If an item normally costs \$105.71, what is its sale price?

Write the following in interval notation.

33) $\{x \mid -1 \leq x < 2\}$

A) $(-1, 2)$

B) $[-1, 2]$

C) $(-1, 2]$

D) $[-1, 2)$

Solve the inequality symbolically. Express the solution set in interval notation.

34) $-4(4y + 1) < -20y + 16$

35) $-10 \leq -2 - 6x \leq 11$

Solve the inequality graphically. Express the solution in set-builder notation.

36) $36x - 30 > 6(5x - 7)$

A) $\{x|x < -2\}$

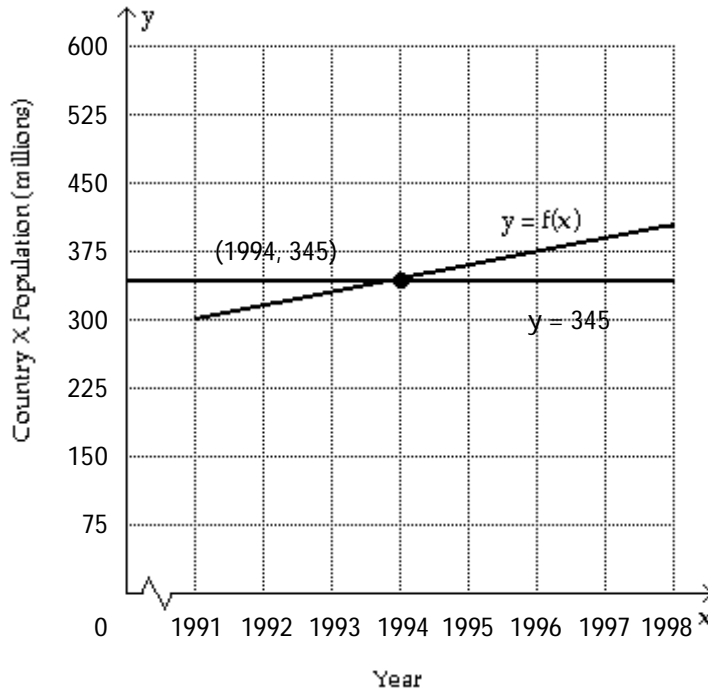
B) $\{x|x < 36\}$

C) $\{x|x > 36\}$

D) $\{x|x > -2\}$

Solve the problem.

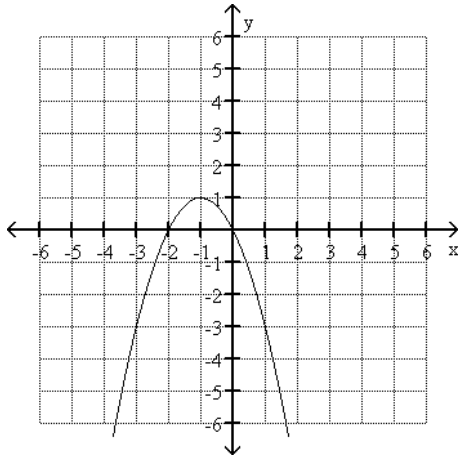
37)



The function f models the population of Country X from 1991 to 1998. The graphs of f and the horizontal line $y = 345$ are shown in the figure. Use the graphs to determine when there was (i) a population equal to 345 million and (ii) a population of 345 million or less.

Use the graph of the quadratic function to determine the sign of the leading coefficient, the vertex, and the equation of the axis of symmetry.

38)



- A) Negative; $(-1, 1)$; $y = 1$
- C) Negative; $(-1, 1)$; $x = -1$

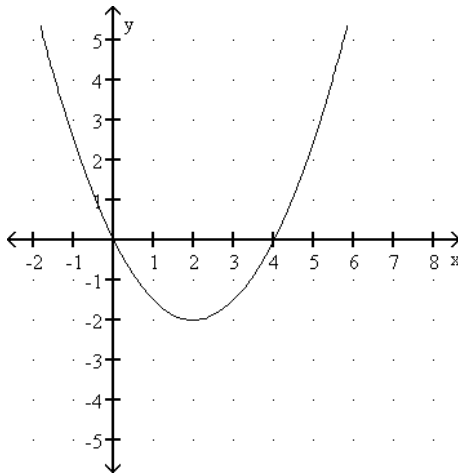
- B) Positive; $(-1, 1)$; $x = -1$
- D) Positive; $(1, 1)$; $x = 1$

Determine the vertex of the graph of f .

39) $f(x) = \frac{1}{4}(x + 3)^2 + 4$

Use the given graph of the quadratic function f to write its formula as $f(x) = a(x - h)^2 + k$.

40)



Solve the problem.

41) 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 2040.

- A) 43.2 million tons
- B) 38.0 million tons
- C) 33.4 million tons
- D) 41.1 million tons

Solve the quadratic equation.

42) $x^2 - 2x - 8 = 0$

43) $(p + 8)^2 = 13$

A) $\pm\sqrt{13} + 8$

B) $\sqrt{13} - \sqrt{8}$

C) $-8 \pm \sqrt{13}$

D) No real solutions

44) $2x^2 + 6x = -3$

A) $\frac{-3 \pm \sqrt{3}}{2}$

B) $\frac{-3 \pm \sqrt{3}}{4}$

C) $\frac{-3 \pm \sqrt{15}}{2}$

D) $\frac{-6 \pm \sqrt{3}}{2}$

Use a calculator to find a graphical solution to the equation. Express results to the nearest thousandth.

45) $3y^2 - 5y = 1$

Solve the problem.

46) Your company uses the quadratic model $y = -11x^2 + 350x$ to represent how many units (y) of a new product will be sold (x) weeks after its release. How many units can you expect to sell in week 17?

A) 6137 units

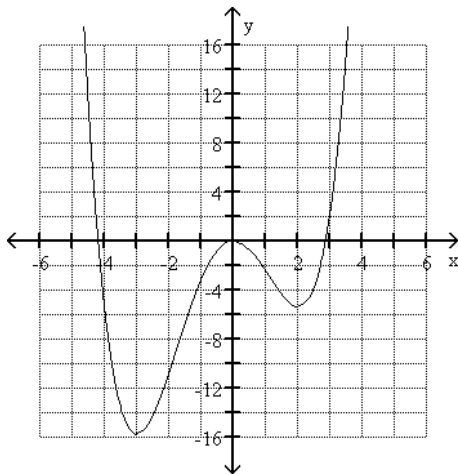
B) 5763 units

C) 2771 units

D) 9129 units

The graph of a polynomial is given. Identify the degree of the polynomial, the turning points, and any x-intercepts. Also estimate any local maxima or minima and any absolute maxima or minima.

47)



Predict the end behavior of the graph of f.

48) $f(x) = -0.1x^5 - 4x^3 - 6x + 1$

A) Up on left side, down on right side

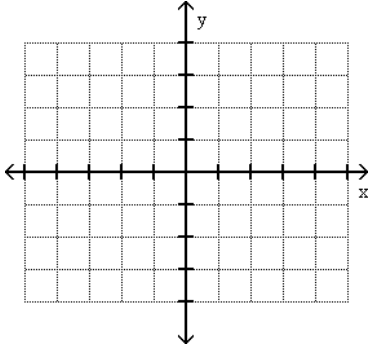
B) Down on left side, up on right side

C) Down on both sides

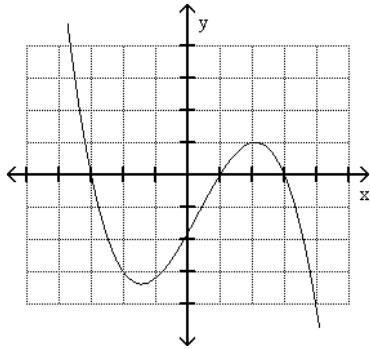
D) Up on both sides

Pick which graph satisfies the given conditions.

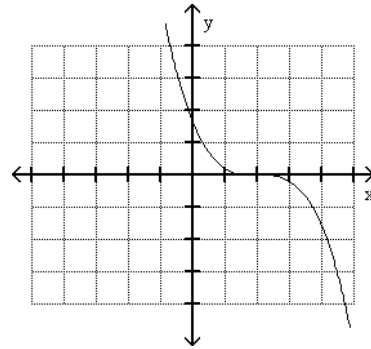
49) Cubic polynomial with two distinct real zeros and a positive leading coefficient.



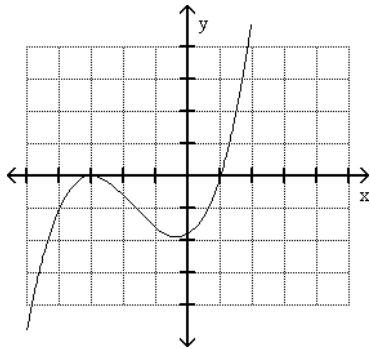
A)



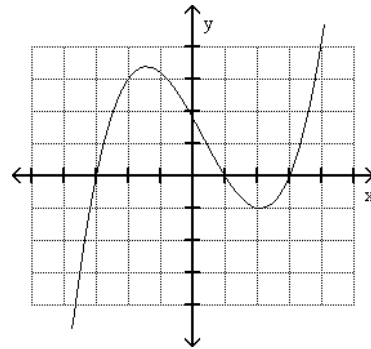
B)



C)



D)



Solve the problem.

50) The table lists the percentage y of high school seniors that had used a certain drug within the previous month in a certain city for various years x . In this table $x = 0$ corresponds to 1975 and $x = 20$ to 1995.

x (yr)	0	4	8	12	16	20
y (%)	32	45	36	31	24	29

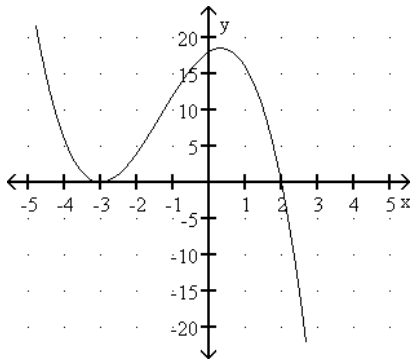
Determine whether a linear, quadratic, cubic, or quartic polynomial best fits this data.

Use the given information about a polynomial function $f(x)$ to write its complete factored form.

51) Degree 4; zeros: 3, 1, 3, -3; leading coefficient = 1

The graph of either a cubic or quartic polynomial $f(x)$ with leading coefficient ± 1 and integer zeros is shown. Write the complete factored form of $f(x)$.

52)



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

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

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

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

Write the complete factored form of the polynomial $f(x)$.

53) $f(x) = 2x^4 + 3x^3 - 4x^2 - 3x + 2$

Solve the polynomial equation symbolically.

54) $x^3 - 25x = 0$

Solve the problem.

55) The polynomial function $I(t) = -0.1t^2 + 1.5t$ represents the yearly income (or loss) from a real estate investment, where t is time in years. After how many years does income begin to decline? Round to the nearest tenth of a year, if necessary.

A) 7.5 years

B) 10 years

C) 6.5 years

D) 15 years

56) A population of birds in a small county can be modeled by the polynomial $f(x) = x^3 - 57x^2 + 1162x + 1094$, where $x = 1$ corresponds to July 1, $x = 2$ to July 2, and so on. For what days does f estimate the population to be 8550?

Determine whether the given equation is a rational function.

57) $f(x) = \frac{-3x - 7}{x^2 + \sqrt{x + 7}}$

A) Yes

B) No

Find the domain of f .

58) $f(x) = \frac{x - 5}{x^2 + 3x}$

A) $\{x \mid x \neq -3\}$

B) $\{x \mid x \neq 0, x \neq -3\}$

C) $\{x \mid x \neq 5\}$

D) $\{x \mid x \neq 3\}$

Find any vertical asymptotes.

59) $f(x) = \frac{x - 6}{x^2 - 4}$

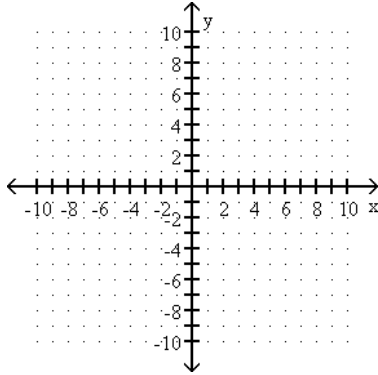
Find the horizontal asymptote of the given function.

$$60) g(x) = \frac{x + 5}{x^2 - 2}$$

$$61) h(x) = \frac{24x^2}{8x^2 - 6}$$

Sketch the graph of the rational function.

$$62) f(x) = \frac{2x}{(x + 2)(x - 1)}$$



Write a symbolic representation of a rational function f that satisfies the conditions.

- 63) Vertical asymptotes $x = 5$ and $x = -7$,
horizontal asymptote $y = -3$

Solve the rational equation symbolically, numerically, or graphically.

$$64) 1 + \frac{1}{x} = \frac{6}{x^2}$$

Solve the problem.

- 65) In the following formula, y is the minimum number of hours of studying required to attain a test score of x : $y = \frac{0.48x}{100.5 - x}$. How many hours of study are needed to score 85?
- 66) The time T necessary to make an enlargement of a photo negative varies directly as the area A of the enlargement. If 36 seconds are required to make a 3-by-4 enlargement, find the time required for a 7-by-5 enlargement.
A) 105 sec B) 175 sec C) 140 sec D) 70 sec
- 67) The gravitational attraction A between two masses varies inversely as the square of the distance between them. If the force of attraction is 2.25 lb when the masses are 4 ft apart, what is the attraction when the masses are 6 ft apart?
A) 1 lb B) 2 lb C) 4 lb D) 3 lb

Complete numerical representations for the functions f and g are given. Evaluate the expression, if possible.

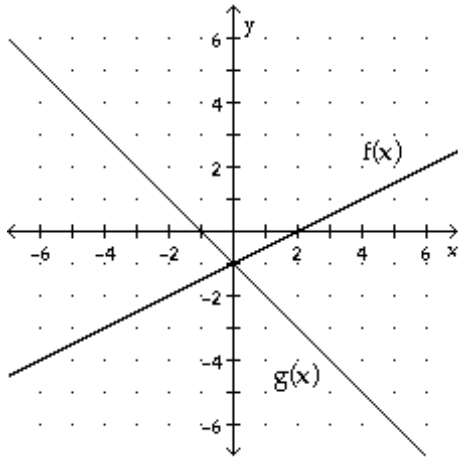
68) $(g \circ f)(1)$

x	1	7	11	12
f(x)	-3	11	2	14

x	-5	-3	1	3
g(x)	1	-6	7	11

Use the graph to evaluate the expression.

69) $(g \circ f)(4)$



A) 1

B) -4

C) -2

D) $-\frac{7}{2}$

Find functions f and g so that $F(x) = (f \circ g)(x)$.

70) $F(x) = \frac{1}{\sqrt{4x+4}}$

Find the indicated composite for the pair of functions.

71) Given $f(x) = \frac{x-3}{4}$ and $g(x) = 4x+3$, find $(g \circ f)(x)$.

A) $4x+9$

B) $x+6$

C) x

D) $x - \frac{3}{4}$

Describe the inverse of the statement.

72) Multiply x by 5 and add 4.

A) Subtract 4 from x and divide the result by 5.

B) Multiply x by $\frac{1}{5}$ and add -4.

C) Divide x by 5 and subtract 4.

D) Add 4 to x and multiply the result by 5.

Find a symbolic representation for $f^{-1}(x)$.

73) $f(x) = 4x^3 + 7$

Determine i) the domain of the function, ii) the range of the function, iii) the domain of the inverse, and iv) the range of the inverse.

74) $f(x) = \sqrt{3x - 2}$

A) $f(x): D = \left\{x \mid x \geq \frac{2}{3}\right\}, R = \{y \mid y \geq 0\};$

$f^{-1}(x): D$ is all real numbers, $R = \left\{y \mid y \geq \frac{2}{3}\right\}$

C) $f(x): D = \{x \mid x \geq 0\}, R = \{y \mid y \geq 0\};$

$f^{-1}(x): D = \{x \mid x \geq 0\}, R = \left\{y \mid y \geq \frac{2}{3}\right\}$

B) $f(x): D = \left\{x \mid x \geq \frac{2}{3}\right\}, R$ is all real numbers;

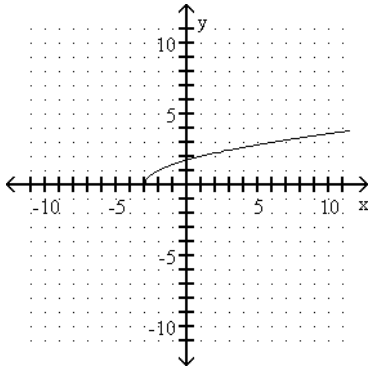
$f^{-1}(x): D$ is all real numbers, $R = \left\{y \mid y \geq \frac{2}{3}\right\}$

D) $f(x): D = \left\{x \mid x \geq \frac{2}{3}\right\}, R = \{y \mid y \geq 0\};$

$f^{-1}(x): D = \{x \mid x \geq 0\}, R = \left\{y \mid y \geq \frac{2}{3}\right\}$

Use the graph of f to sketch a graph of the inverse of f using a dashed curve.

75)



Solve the problem.

76) Let $f(x)$ compute the cost of a rental car after x days of use at \$26 per day. What does $f^{-1}(x)$ compute?

- A) The number of days rented for 26 dollars
C) The number of days rented for x dollars

- B) The cost of rental for x days
D) The cost of rental for 26 days

Simplify the expression without a calculator.

77) $\left(\frac{1}{2}\right)^{-4}$

A) $-\frac{1}{16}$

B) -16

C) $\frac{1}{16}$

D) 16

Find either a linear or an exponential function that models the data in the table.

78)

x	0	1	2	3	4
y	7	28	112	448	1792

A) $f(x) = \frac{1}{21}x + 7$

B) $f(x) = 7(4)^x$

C) $f(x) = 4(7)^x$

D) $f(x) = 21x + 7$

Solve the problem.

79) In 1995 the population of a certain city was 48,000. Since then, the population has been growing at the rate of 2% per year. Is this an example of linear or exponential growth? Find a function f that computes the population x years after 1995.

A) Linear; $f(x) = 960x + 48,000$

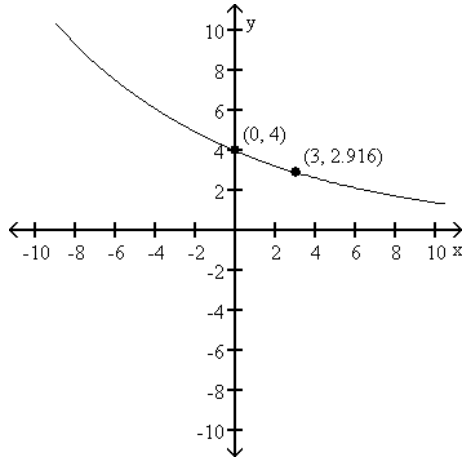
B) Exponential; $f(x) = 48,000(0.02)^x$

C) Exponential; $f(x) = 48,000(1.02)^x$

D) Linear; $f(x) = 0.02x + 48,000$

Determine a formula for the exponential function.

80)



Solve the problem.

81) How long will it take for \$900 to grow to \$2600 at an interest rate of 2.5% if the interest is compounded continuously? Round the number of years to the nearest hundredth.

Use the compound interest formula to determine the final value of the given amount.

82) \$480 at 9% compounded quarterly for 6 years

A) \$800.75

B) \$818.77

C) \$338.77

D) \$805.01

Solve the problem.

83) Suppose the amount of a radioactive element remaining in a sample of 100 milligrams after x years can be described by $A(x) = 100e^{-0.01283x}$. How much is remaining after 296 years? Round the answer to the nearest hundredth of a milligram.

A) 379.77 milligrams

B) 2.24 milligrams

C) 0.02 milligrams

D) 4459.76 milligrams

Evaluate the logarithm.

84) $\log_8\left(\frac{1}{64}\right)$

A) -8

B) 8

C) -2

D) 2

Evaluate the expression by hand, if possible.

85) $\log\sqrt[4]{1000}$

A) $\sqrt[4]{3}$

B) $\frac{3}{4}$

C) 3

D) 12

Solve the equation symbolically.

86) $10^x = 224$

87) $3 \ln x - 8 = 8$

Solve the problem.

88) Wind speed varies in the first twenty meters above the ground. For a particular day, let $f(x) = 1.3 \ln x + 4.1$ compute the wind speed x meters above the ground. What is the wind speed 12 meters above the ground? Round results to the nearest hundredth.

- A) -0.87 meters per second
B) 5.93 meters per second
C) 7.33 meters per second
D) 6.58 meters per second

Expand the expression.

89) $\log_3 \frac{x^3 y^5}{6}$

- A) $3 \log_3 x + 5 \log_3 y - \log_3 6$
B) $3 \log_3 x - 5 \log_3 y - \log_3 6$
C) $3 \log_3 x + 5 \log_3 y + \log_3 6$
D) $(3 \log_3 x)(5 \log_3 y) - \log_3 6$

Write the expression as one logarithm.

90) $\log \sqrt[5]{x} + \log x^4 - \log x^2$

- A) $11 \log x$
B) $\frac{9}{5} \log x$
C) $\frac{11}{5} \log x$
D) $7 \log x$

Use the change of base formula to approximate the logarithm to four decimal places.

91) $\log_8 37.94$

Use common or natural logarithms to solve the exponential equation symbolically.

92) $\left(\frac{1}{3}\right)^x = 18$

- A) $x = -\frac{\ln 18}{\ln 3}$
B) $x = \frac{\ln 18}{\ln 3}$
C) $x = \ln \frac{1}{6}$
D) $x = \ln 6$

Solve the logarithmic equation symbolically.

93) $102 + 4 \log x = 70$

- A) No solution
B) $x = -10^8$
C) $x = -80$
D) $x = 10^{-8}$

Solve the problem.

94) Suppose $f(x) = 33.0 + 1.3 \log(x + 1)$ models salinity of ocean water to depths of 1000 meters at a certain latitude. x is the depth in meters and $f(x)$ is in grams of salt per kilogram of seawater. Approximate the depth (to the nearest tenth of a meter) where the salinity equals 38.

95) Suppose the number of Quickie hamburgers (in millions) served yearly from 1987 to 2000 can be modeled by $f(x) = 31.5e^{0.18x}$. In this formula $x = 0$ corresponds to 1987 and $x = 13$ corresponds to 2000. Approximate the year when this amount will reach 117 million.

96) The table contains data that can be modeled by an exponential function of the form $f(x) = ba^x$. Use regression to determine an exponential function f that models this data. Round the coefficients to the nearest hundredth.

x	1	2	3	4
y	580	620	670	750

- A) $f(x) = (1.09)(527.34)^x$
B) $f(x) = (527.34)(1.09)^x$
C) $f(x) = (567.57)(0.17)^x$
D) $f(x) = (0.17)(567.57)^x$

Make a scatterplot of the data. Then find an exponential, logarithmic, or logistic function f that best models the data. Round function values to the nearest hundredth.

97)

x	1	2	3	4	5
y	0.1	0.7	3.0	5.3	5.9

