MATH 1730 Precalculus Final Exam Review

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the problem.

1) A local race for charity has taken place since 1993. In 1993, the winning speed was 5 miles per hour. The winning speed increased, on average, by 0.16 miles per hour each year in the period 1993-1998. If this trend continues, in which year is the winning speed predicted to be 6.6 mph? 1) _____

A) 2003 B) 2004 C) 2002 D) 2005

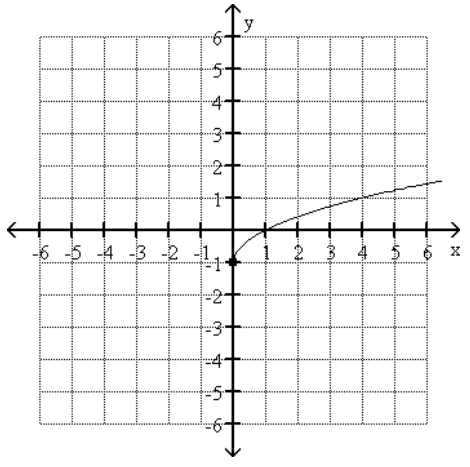
Write the standard form of the equation of the circle with the given center and radius.

2) (0, -6); $\sqrt{3}$ 2) _____

A) $(x + 6)^2 + y^2 = 9$ B) $(x - 6)^2 + y^2 = 9$ C) $x^2 + (y - 6)^2 = 3$ D) $x^2 + (y + 6)^2 = 3$

Use the graph to determine the function's domain and range.

3) 3) _____



A) domain: $[0, \infty)$
range: $(-\infty, \infty)$

B) domain: $(-\infty, \infty)$
range: $[-1, \infty)$

C) domain: $[0, \infty)$
range: $[0, \infty)$

D) domain: $[0, \infty)$
range: $[-1, \infty)$

Evaluate the function at the given value of the independent variable and simplify.

4) $f(x) = 4x^2 + 2x + 6$; $f(x - 1)$ 4) _____

A) $4x^2 - 6x + 8$ B) $4x^2 + 26x + 12$ C) $4x^2 - 6x + 12$ D) $-6x^2 + 4x + 8$

Compute the average rate of change of f from x_1 to x_2. Round your answer to two decimal places when appropriate. Interpret your result graphically.

5) $f(x) = x^3 - 4x$, $x_1 = 2$ and $x_2 = 4$ 5) _____

A) 24; the slope of the line passing through (2, f(2)) and (4, f(4)) is 24.
B) -24; the slope of the line passing through (2, f(2)) and (4, f(4)) is -24.
C) -8; the slope of the line passing through (2, f(2)) and (4, f(4)) is -8.
D) 8; the slope of the line passing through (2, f(2)) and (4, f(4)) is 8.

Specify the domain of the function.

6) $f(x) = \frac{\sqrt{x+5}}{(x+1)(x-6)}$ 6) _____

A) All real numbers
B) $x \neq -5, x \neq -1, x \neq 6$
C) $x > 0$
D) $x \geq -5, x \neq -1, x \neq 6$

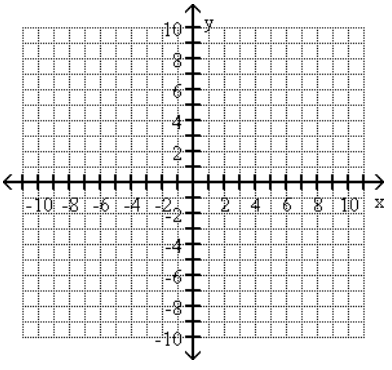
Identify where f is increasing or where f is decreasing, as indicated. Round your answer to two decimal places when appropriate.

7) $f(x) = -6x^2 + 12x - 4$; decreasing 7) _____

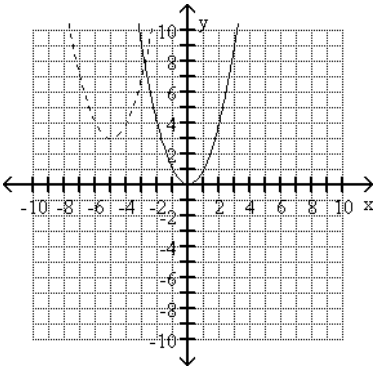
A) $(-\infty, -1]$ B) $[-1, \infty)$ C) $[1, \infty)$ D) $(-\infty, 1]$

Begin by graphing the standard quadratic function $f(x) = x^2$. Then use transformations of this graph to graph the given function.

8) $h(x) = (x - 5)^2 + 3$ 8) _____



A)



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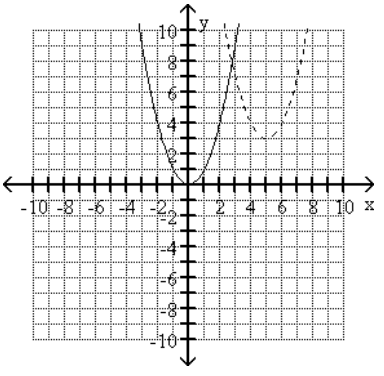

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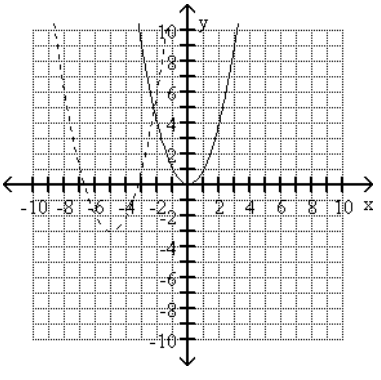

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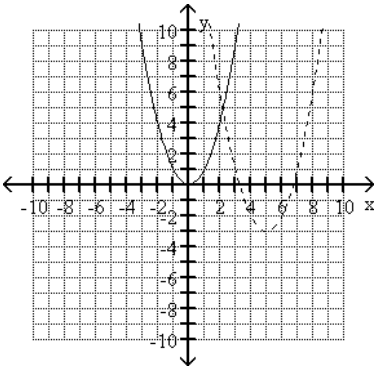
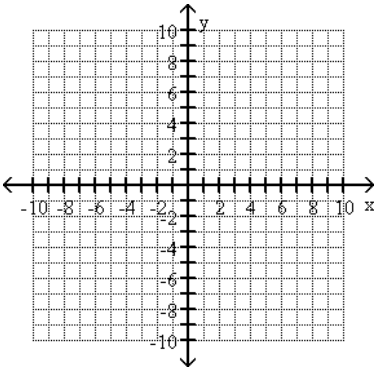
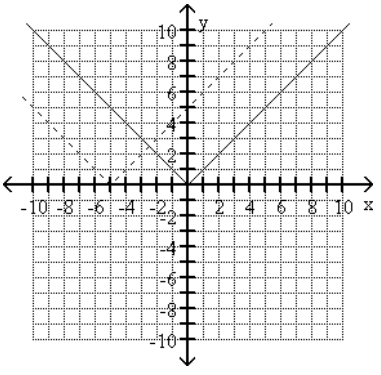


Begin by graphing the standard absolute value function $f(x) = |x|$. Then use transformations of this graph to graph the given function.

9) $h(x) = -|x + 5|$ 9) _____



A)



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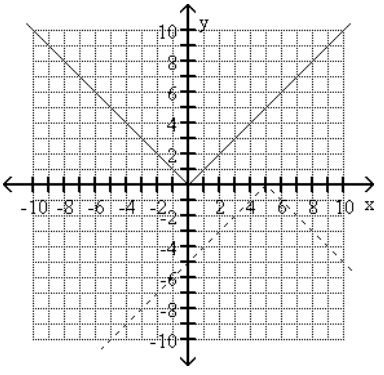
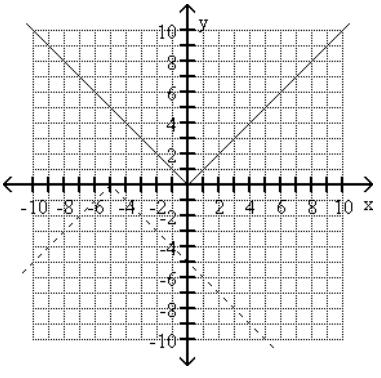
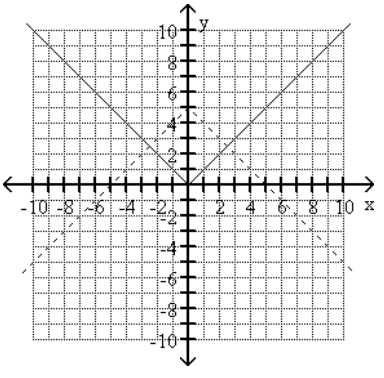


C)

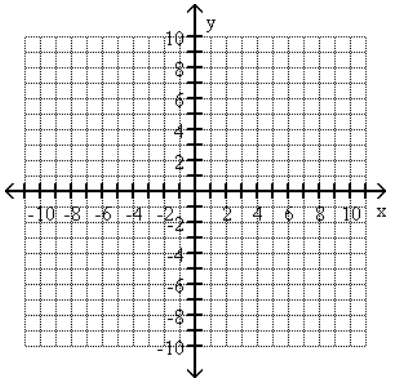


D)

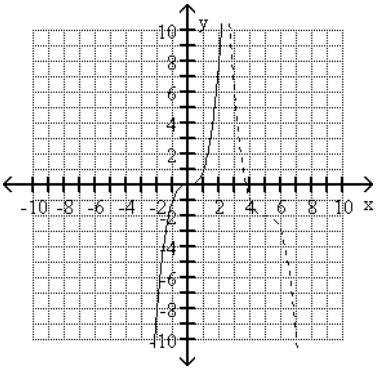


Begin by graphing the standard cubic function $f(x) = x^3$. Then use transformations of this graph to graph the given function.

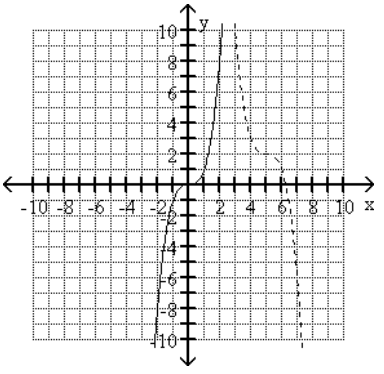
10) $g(x) = -(x - 5)^3 - 2$ 10) _____



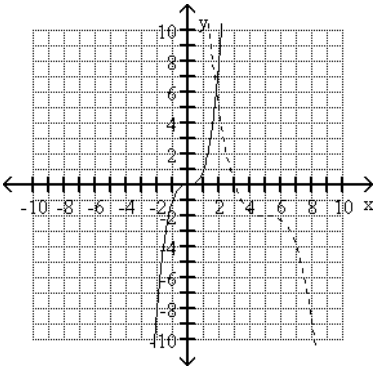
A)



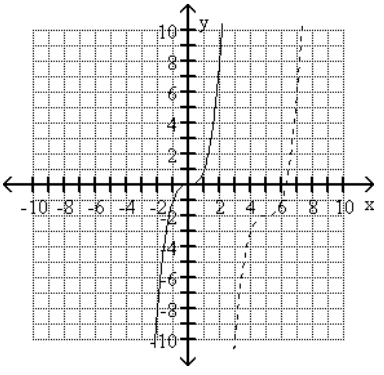
B)



C)



D)



For the given functions f and g , find the indicated composition.

11) $f(x) = \frac{x - 4}{5}$, $g(x) = 5x + 4$ 11) _____

$(g \circ f)(x)$

A) x B) $x - \frac{4}{5}$ C) $x + 8$ D) $5x + 16$

Find the domain of the function.

12) $\frac{x}{\sqrt{x - 4}}$ 12) _____

A) $[4, \infty)$ B) $(-\infty, \infty)$ C) $(4, \infty)$ D) $(-\infty, 4) \cup (4, \infty)$

13) $f(x) = \frac{1}{x - 2} + \frac{4}{x + 6}$ 13) _____

A) $(-\infty, -6) \cup (-6, \infty)$ B) $(-\infty, \infty)$

C) $(-\infty, 2) \cup (2, \infty)$ D) $(-\infty, -6) \cup (-6, 2) \cup (2, \infty)$

Find the inverse of the one-to-one function.

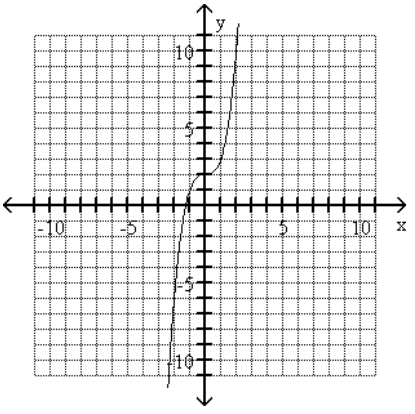
14) $f(x) = (x + 3)^3$ 14) _____

A) $f^{-1}(x) = \sqrt{x} - 3$ B) $f^{-1}(x) = \sqrt[3]{x} + 3$

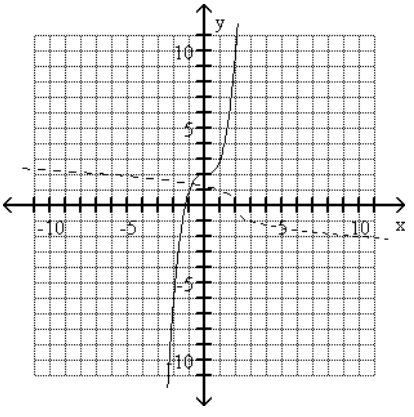
C) $f^{-1}(x) = \sqrt[3]{x} - 3$ D) $f^{-1}(x) = \sqrt[3]{x} - 27$

Use the graph of f to draw the graph of its inverse function.

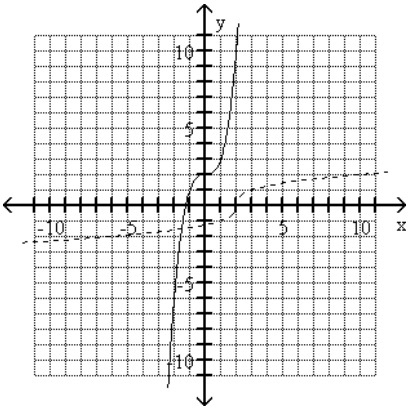
15) 15) _____



A)



B)



Solve the problem.

16) A car rental agency charges $150 per week plus $0.45 per mile to rent a car. Express the weekly cost to rent the car, f, as a function of the number of miles driven during the week, x. 16) _____

A) $f(x) = 0.45x - 150$ B) $f(x) = 150x + 0.45$

C) $f(x) = 150.45$ D) $f(x) = 0.45x + 150$

17) The following table gives the outside temperature in degrees Fahrenheit on a winter day in Death Valley, California. 17) _____

Time	7:00 am	8:00 am	9:00 am	10:00 am	11:00 am
Temperature (°F)	76	82	83	89	93

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

A) 4.70°F B) 3.67°F C) 3.98°F D) 2.60°F

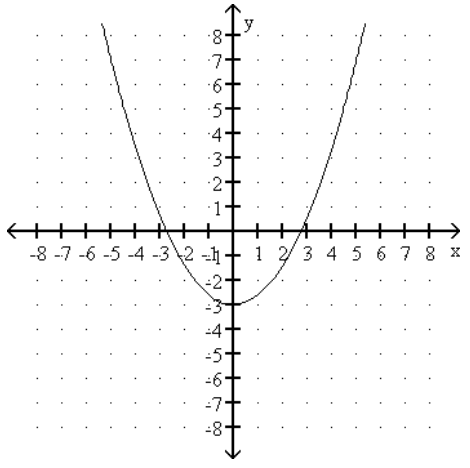
Write the slope-intercept form of the equation for the line passing through the given pair of points.

18) (4, 0) and (6, 9) 18) _____

A) $y = -\frac{4}{3}x + 17$ B) $y = \frac{4}{3}x + 17$ C) $y = \frac{9}{2}x - 18$ D) $y = -\frac{9}{2}x - 18$

Use the graph and formula for f(x) to find the average rates of change of f from -4 to -1 and from 1 to 4.

19) $y = -0.4x^2 + 3$ 19) _____



A) -2; 2 B) -2; -2 C) 2; -2 D) 2; 2

Find and simplify the difference quotient $\frac{f(x+h) - f(x)}{h}$, $h \neq 0$ for the given function.

20) $f(x) = x^2 + 9x - 7$ 20) _____

A) 2x + h + 9 B) 2x + h - 7

C) $\frac{2x^2 + 2x + 2xh + h^2 + h - 14}{h}$ D) 1

Evaluate the piecewise function at the given value of the independent variable.

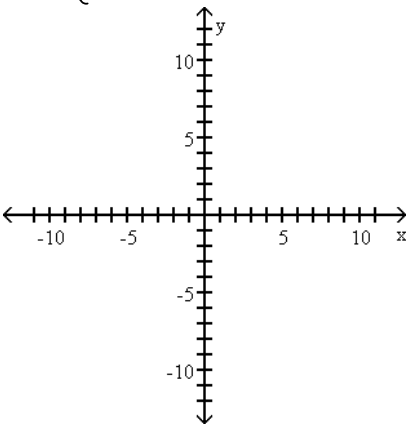
21) $f(x) = \begin{cases} x + 3 & \text{if } x > -2 \\ -(x + 3) & \text{if } x \leq -2 \end{cases}$; $f(-6)$ 21) _____

A) 18 B) -3 C) 3 D) -6

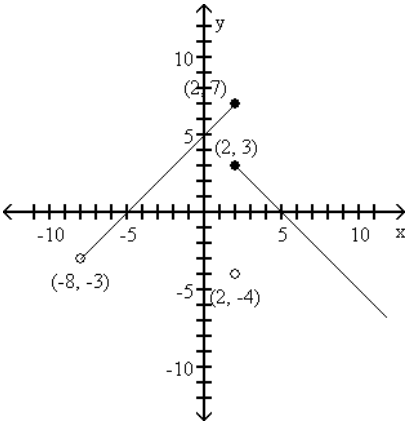
Graph the function.

22) $f(x) = \begin{cases} x + 5 & \text{if } -8 \le x < 2 \\ -4 & \text{if } x = 2 \\ -x + 5 & \text{if } x > 2 \end{cases}$

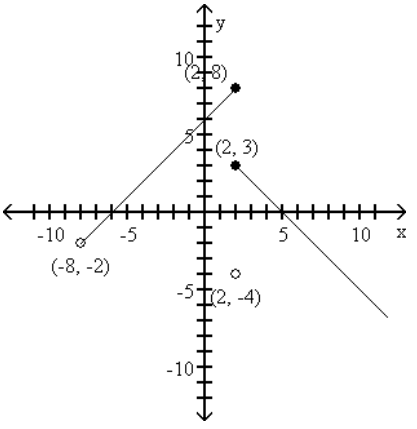
22) _____



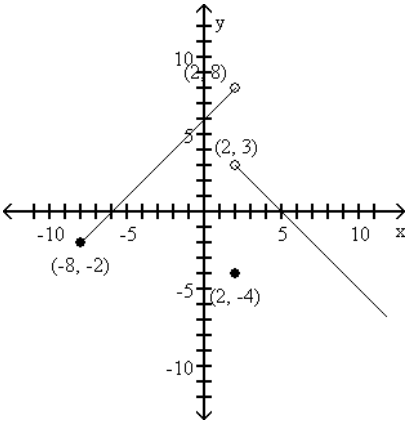
A)



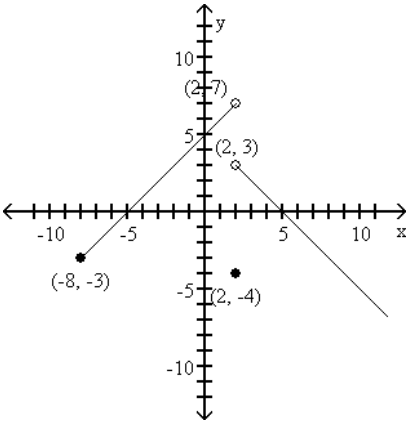
B)



C)

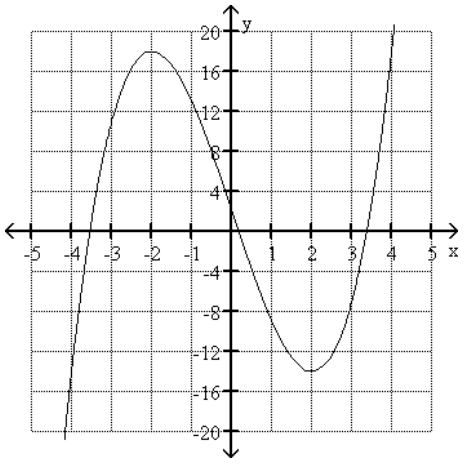


D)



Use the graph of the given function to find any relative maxima and relative minima.

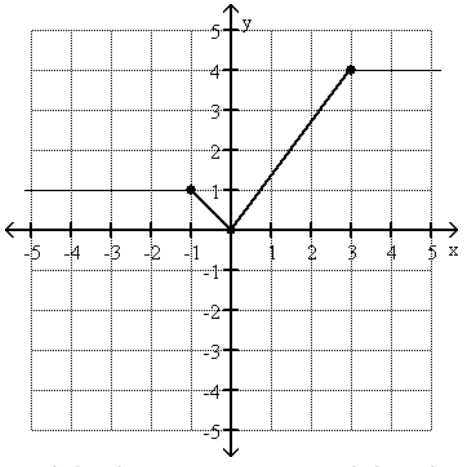
23) $f(x) = x^3 - 12x + 2$ 23) _____



A) no maximum or minimum
B) maximum: (-2, 18) and (0, 0); minimum: (2, -14)
C) minimum: (2, -14); maximum: (-2, 18)
D) maximum: (2, -14); minimum: (-2, 18)

Identify the intervals where the function is changing as requested.

24) Increasing 24) _____

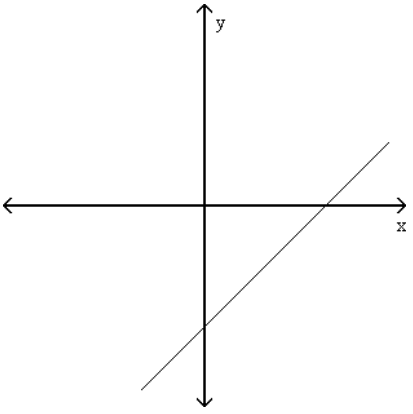


A) (0, 3) B) (-1, 0) C) $(-\infty, 0)$ D) $(-\infty, -1)$

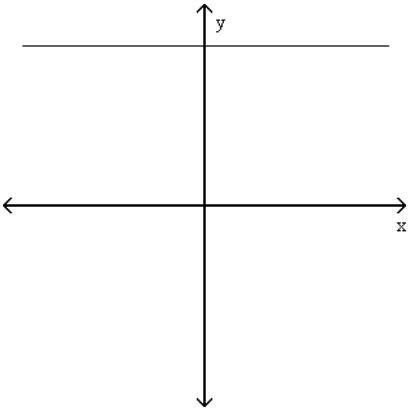
Identify all of the given graphs that illustrate the specified characteristics.

25) Characteristics: Has both positive and negative rates of change. 25) _____

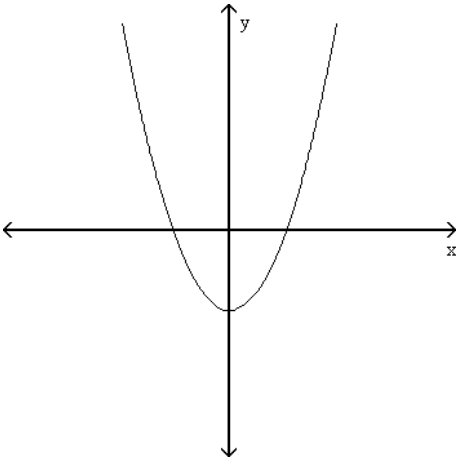
I



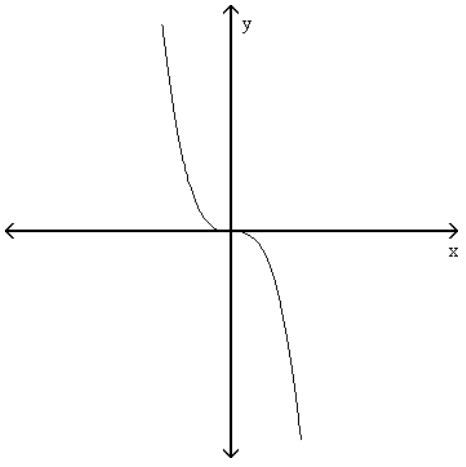
II



III



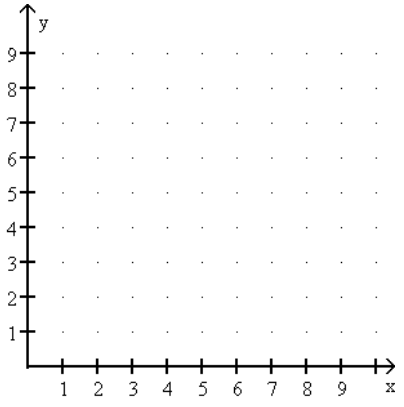
IV



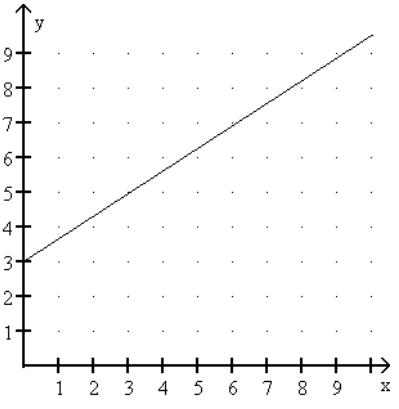
A) Graph I
B) Graph I and II
C) Graphs III and IV
D) Graph III

Represent the function by way of a graph.

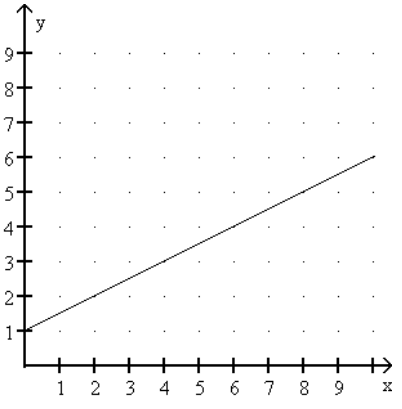
26) The total cost in dollars of a taxi ride is given by the function f(x) = .65x + 3, where x is the number of miles driven.
Graph f in [0,10,1] by [0,10,1]. 26) _____



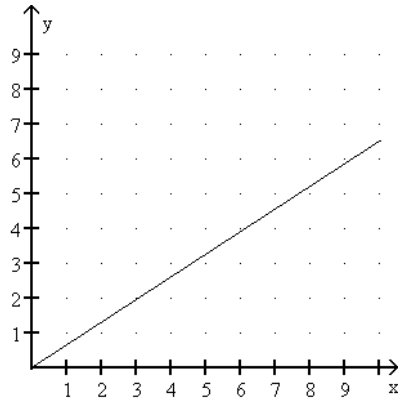
A)



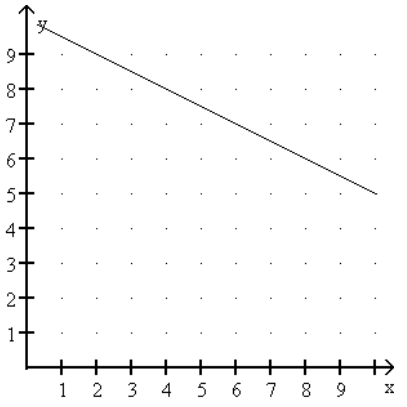
B)



C)

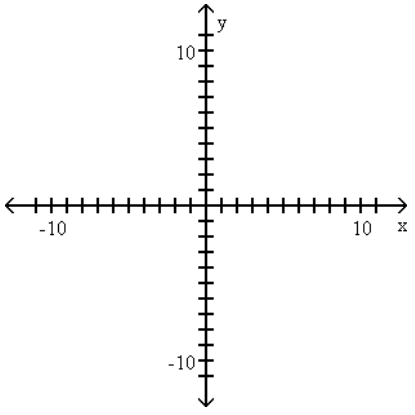


D)

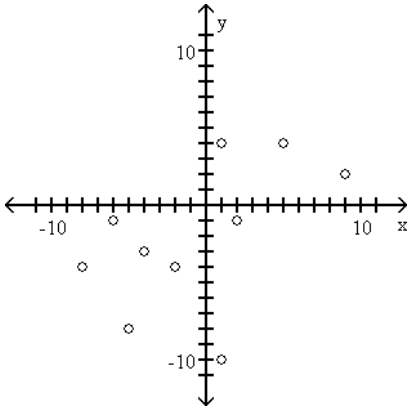


Make a scatterplot of the relation.

27) {(5, 4),(-6, -1),(-5, -8),(-8, -4),(1, 4),(2, -1),(1, -10),(9, 2),(-4, -3),(-2, -4)} 27) _____



A)



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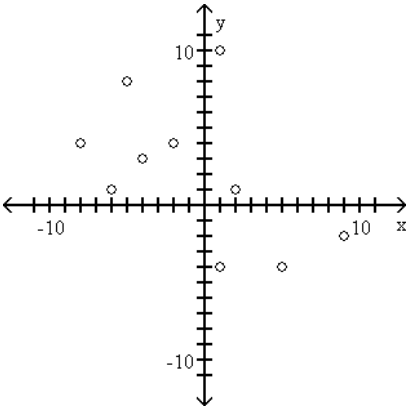
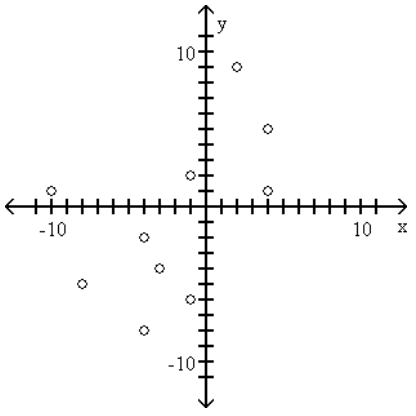
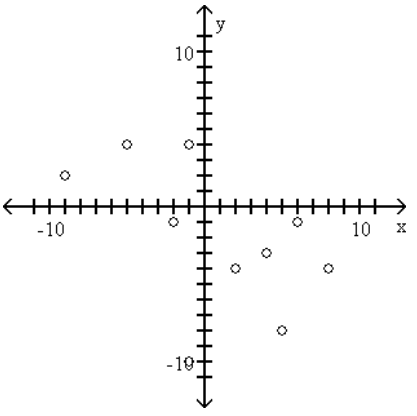


C)



D)



Identify where f is increasing and where f is decreasing.

28) $f(x) = |x - 4|$ 28) _____

A) increasing: $(-\infty, 4]$; decreasing: $[4, \infty)$
B) increasing: $[4, \infty)$; decreasing: $(-\infty, 4]$
C) increasing: $(-\infty, -4]$; decreasing: $[-4, \infty)$
D) increasing: $[-4, \infty)$; decreasing: $(-\infty, -4]$

Find an equation of the line satisfying the following conditions.
If possible, write the equation in slope-intercept form.

29) y-intercept -2, x-intercept 5 29) _____

A) $y = -\frac{2}{5}x - 2$
B) $y = \frac{2}{5}x + 2$
C) $y = \frac{2}{5}x - 2$
D) $y = \frac{5}{2}x - 2$

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

30) Through (-7, 2), parallel to $-7x + 3y = 61$ 30) _____

A) $y = \frac{3}{7}x - \frac{2}{7}$
B) $y = \frac{7}{3}x + \frac{55}{3}$
C) $y = \frac{7}{3}x + \frac{61}{3}$
D) $y = -\frac{7}{3}x - \frac{55}{3}$

Rationalize the denominator.

31) $\frac{\sqrt{2}}{\sqrt{13} + 3}$ 31) _____

A) $\frac{3\sqrt{26} + 13\sqrt{39}}{2}$
B) $\frac{\sqrt{26} - 3\sqrt{2}}{16}$
C) $\frac{\sqrt{26} + 3\sqrt{2}}{4}$
D) $\frac{\sqrt{26} - 3\sqrt{2}}{4}$

Perform the operation and write the result in the standard form.

32) $(-9 + 16i) - (5 - 3i)$ 32) _____

A) 4 - 19i
B) -4 - 19i
C) -14 - 19i
D) -14 + 19i

33) $(5 - 3i)(2 + 6i)$ 33) _____

A) 28 - 24i
B) -8 - 36i
C) 28 + 24i
D) $-18i^2 + 24i - 10$

34) $(6 + 4i)^2$ 34) _____

A) 52 - 48i
B) 52 + 48i
C) 20 - 48i
D) 20 + 48i

Write the conjugate $\bar{z}$ of the complex number z. Then find $z\bar{z}$.

35) $z = 8 - 3i$ 35) _____

A) $\bar{z} = 8 + 3i$, $z\bar{z} = 64 - 9i$
B) $\bar{z} = 8 + 3i$, $z\bar{z} = 64 - 9i^2$
C) $\bar{z} = 8 + 3i$, $z\bar{z} = 55$
D) $\bar{z} = 8 + 3i$, $z\bar{z} = 73$

Write the quotient in the standard form.

36) $\frac{7i}{5 + i}$ 36) _____

A) $\frac{7}{26} - \frac{35}{26}i$
B) $-\frac{7}{26} + \frac{35}{26}i$
C) $\frac{7}{26} + \frac{35}{26}i$
D) $\frac{7}{24} + \frac{35}{24}i$

Find the discriminant and determine the number and type of roots of the equation.

37) $x^2 - 6x + 8 = 0$ 37) _____

A) D = 4, two unequal complex roots
B) D = 4, two real unequal roots
C) D = 0, one real root
D) D = -68, two unequal complex roots

38) $36x^2 - 12x + 1 = 0$ 38) _____

A) D = 0, one real root
B) D = -72, two unequal complex roots
C) D = 72, one real root
D) D = 72, two real unequal roots

Solve the problem.

39) The length of a rectangular storage room is 7 feet longer than its width. If the area of the room is 98 square feet, find its dimensions. 39) _____

A) 6 ft by 15 ft
B) 8 ft by 15 ft
C) 6 ft by 13 ft
D) 7 ft by 14 ft

40) A toy rocket is shot vertically upward from the ground. Its distance in feet from the ground in t seconds is given by $s(t) = -16t^2 + 139t$. At what time or times will the ball be 226 ft from the ground? Round your answer to the nearest tenth, if necessary. 40) _____

A) 2.2 and 6.5 sec
B) 135.1 and 142.9 sec
C) 4.3 sec
D) 8.7 sec

Solve the equation.

41) $(5x - 5)^{2/3} - 3 = 13$ 41) _____

A) $\left\{\frac{69}{5}\right\}$
B) $\left\{-\frac{59}{5}, \frac{69}{5}\right\}$
C) $\left\{-\frac{11}{5}, \frac{21}{5}\right\}$
D) $\left\{-\frac{59}{5}\right\}$

42) $\sqrt{2x + 3} - \sqrt{x + 1} = 1$ 42) _____

A) {-3, -1}
B) {3}
C) {-1, 3}
D) $\emptyset$

Solve the problem.

43) An airplane leaves Los Angeles for Denver at a speed of 440 mph. Thirty minutes later, a plane going from Denver to Los Angeles leaves Denver, which is 850 miles from Los Angeles, at a speed of 510 mph. When they meet, how far are they from Denver? 43) _____

A) 338 mi
B) 297 mi
C) 59 mi
D) 119 mi

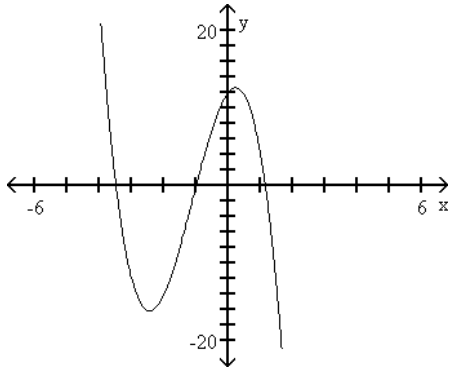
Use the given conditions to find an equation in slope-intercept form of each of the nonvertical lines. Write vertical lines in the form x = h.

44) m = $-\frac{6}{7}$; y-intercept = 2 44) _____

A) $y = -\frac{6}{7}x + 2$ B) $y = \frac{6}{7}x + 2$ C) $y = \frac{6}{7}x - 2$ D) $y = -\frac{6}{7}x - 2$

Find the equation that the given graph represents.

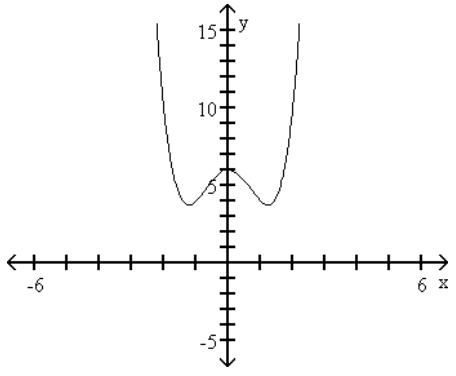
45) 45) _____



A) $f(x) = -3x^3 - 10x^2 + 5x + 12$ B) $f(x) = x^4 - 2x^2 - 3x + 12$

C) $f(x) = 3x^2 - 5x + 12$ D) $f(x) = 2x^3 - 12x^2 - 5x - 12$

46) 46) _____



A) $f(x) = (x + 6)^4$ B) $f(x) = x^4 - 3x^2 + 6$

C) $f(x) = -x^4 + 3x^2 + 6$ D) $f(x) = -x^3 - 6x^2 - x + 6$

Determine the end behavior of the polynomial function.

47) $f(x) = (x - 5)(x - 2)(x - 1)^3$ 47) _____

A) $y \to \infty$ as $x \to -\infty$ and $y \to -\infty$ as $x \to \infty$ B) $y \to -\infty$ as $x \to -\infty$ and $y \to -\infty$ as $x \to \infty$

C) $y \to -\infty$ as $x \to -\infty$ and $y \to \infty$ as $x \to \infty$ D) $y \to \infty$ as $x \to -\infty$ and $y \to \infty$ as $x \to \infty$

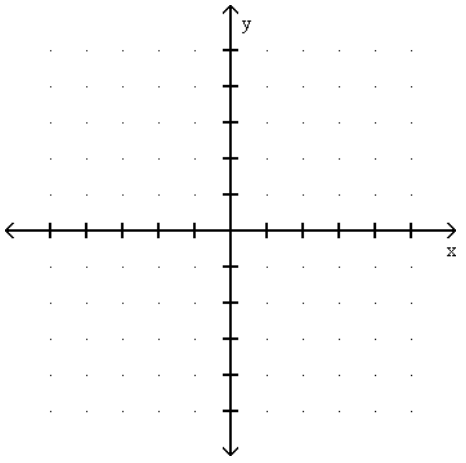
48) $f(x) = -x^2(x - 5)(x + 4)$ 48) _____

A) $y \to -\infty$ as $x \to -\infty$ and $y \to \infty$ as $x \to \infty$ B) $y \to \infty$ as $x \to -\infty$ and $y \to -\infty$ as $x \to \infty$

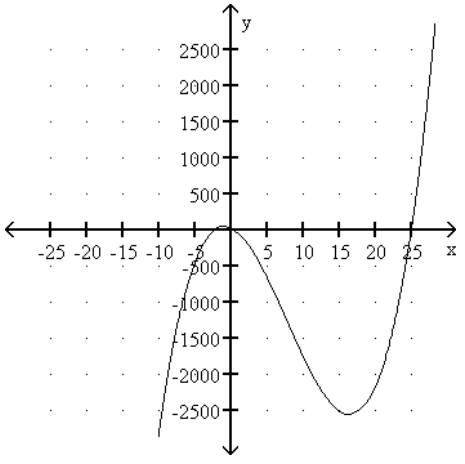
C) $y \to -\infty$ as $x \to -\infty$ and $y \to -\infty$ as $x \to \infty$ D) $y \to \infty$ as $x \to -\infty$ and $y \to \infty$ as $x \to \infty$

Graph the function.

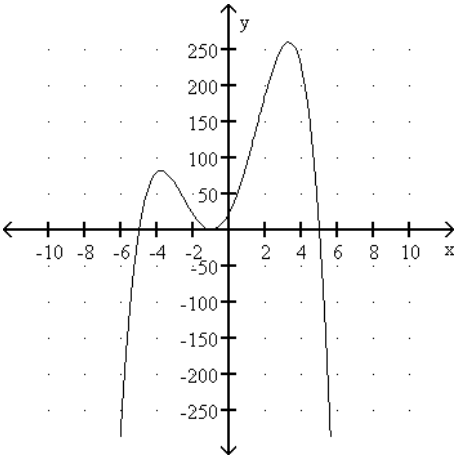
49) $f(x) = (x + 1)^2(x^2 - 25)$ 49) _____



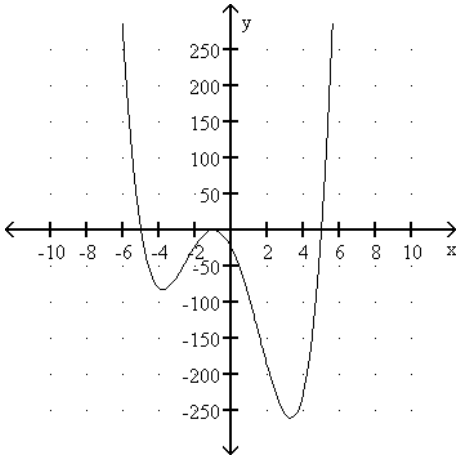
A)



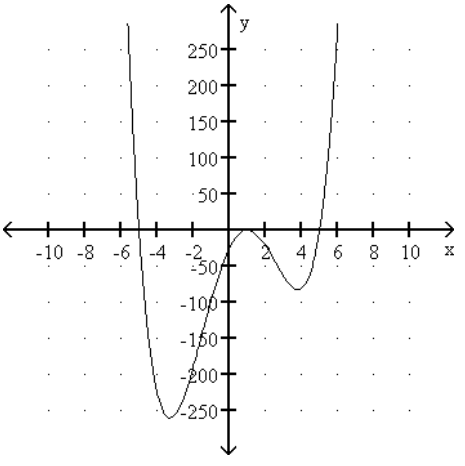
B)



C)

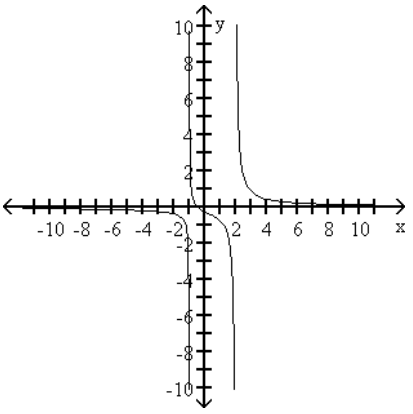


D)



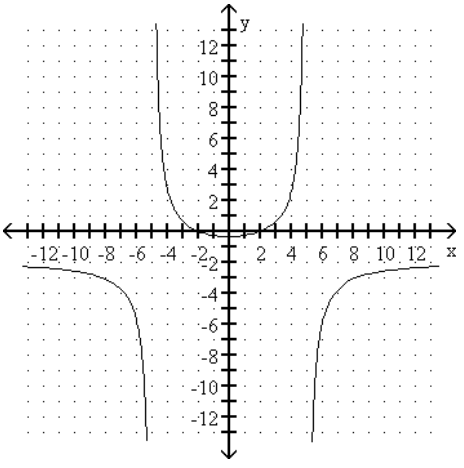
Use the graph of the rational function f(x) to complete the statement.

50) As $x \to 2^+$, $f(x) \to$ ____. 50) _____



A) $-\infty$ B) 0 C) $+\infty$ D) 2

51) The equations of the vertical asymptotes are _____ and _____. 51) _____

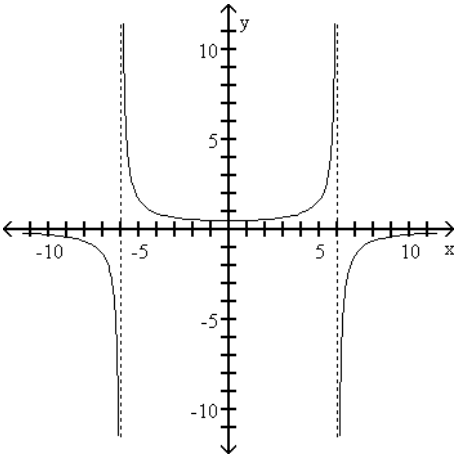


A) x = 2, x = 5 B) x = 5, x = -5 C) x = -2, x = 5 D) x = 2, x = -2

Match the rational function with the appropriate graph.

52) $f(x) = \frac{18}{x^2 + 9}$ 52) _____

A)



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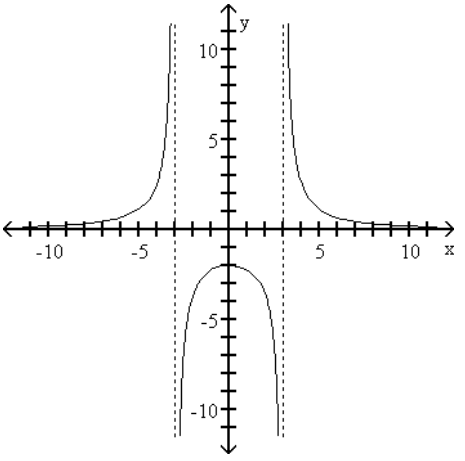
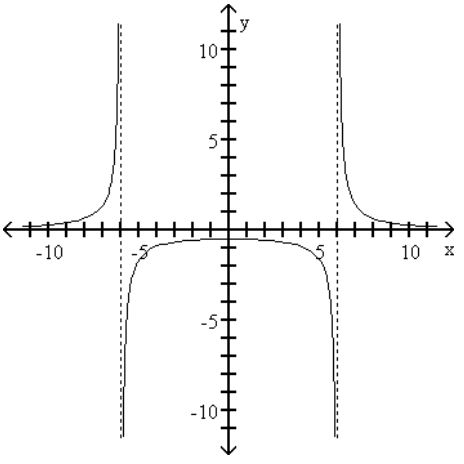
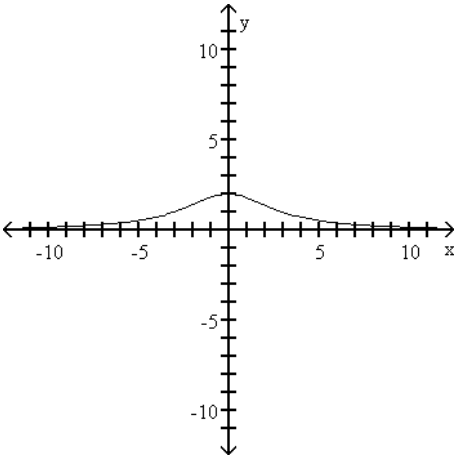


C)



D)



Evaluate the exponential function for the given value.

53) $f(x) = 6^{(1-x)}$, f(3) 53) _____

A) $\frac{1}{12}$ B) -12 C) $\frac{1}{36}$ D) 36

54) $f(x) = 4 - 3^{-x}$, f(2) 54) _____

A) $\frac{37}{9}$ B) $\frac{1}{3}$ C) $\frac{2}{3}$ D) $\frac{35}{9}$

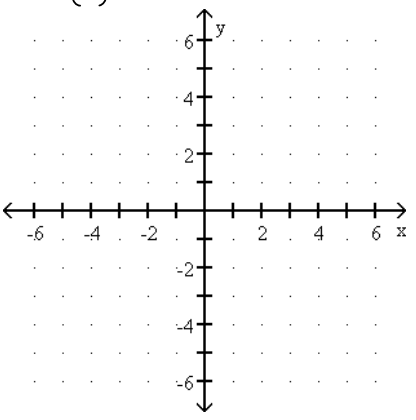
Find the exponential function of the given form that contains the given point(s).

55) Form: $f(x) = c \cdot a^x$ 55) _____
Points: (0, 5) and (2, 20)

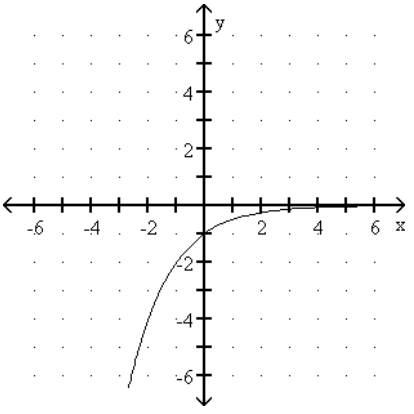
A) $f(x) = 5 \cdot 2^x$ B) $f(x) = 2$ C) $f(x) = 10^x$ D) $f(x) = 2^x$

Graph the function.

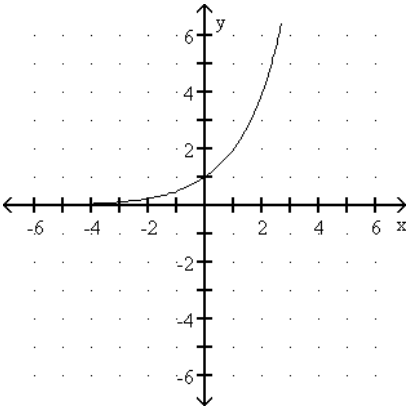
56) $f(x) = \left(\frac{1}{2}\right)^x$ 56) _____



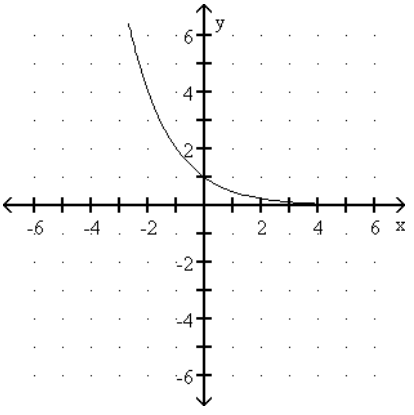
A)



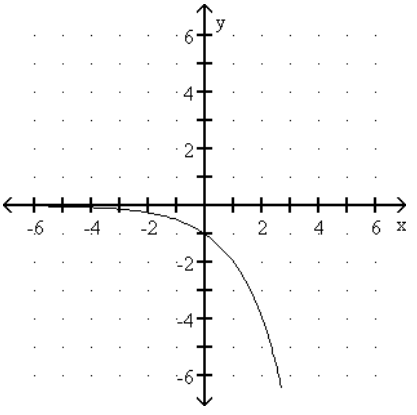
B)



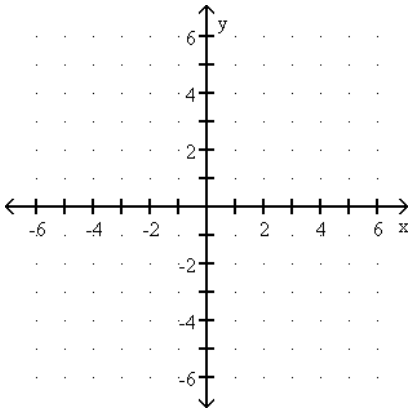
C)



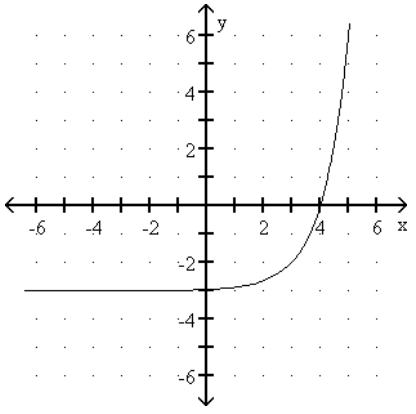
D)



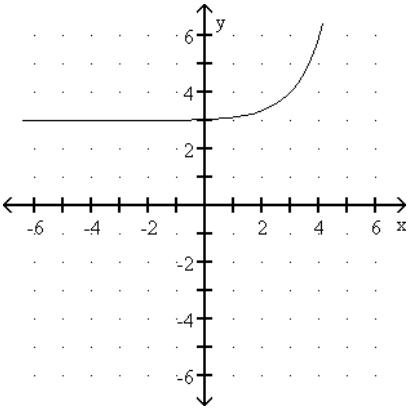
57) $f(x) = 3^{(x + 3)} - 3$ 57) _____



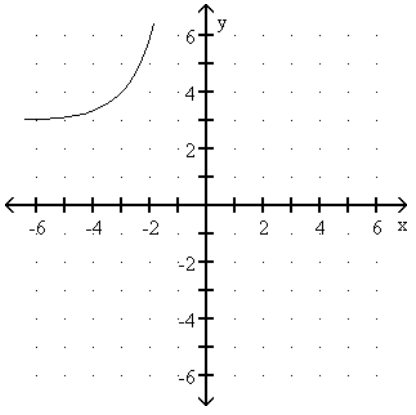
A)



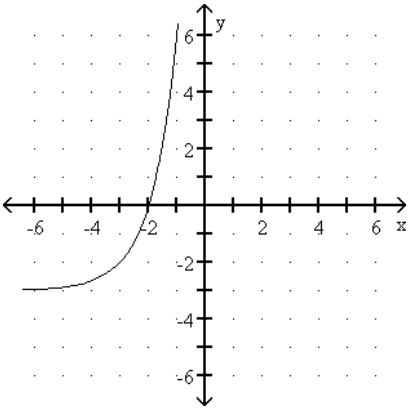
B)



C)



D)



Solve the equation for x by first rewriting both sides as powers of the same base.

58) $3^{(6 - 3x)} = \frac{1}{27}$ 58) _____

A) 3 B) -3 C) 9 D) $\frac{1}{9}$

Solve the problem.

59) The number of bacteria growing in an incubation culture increases with time according to $n(t) = 5200(5)^t$, where t is time in days. After how many days will the number of bacteria in the culture be 650,000? 59) _____

A) 10 days B) 1 day C) 6 days D) 3 days

60) A box contains a radioactive substance. The number of kilograms r(t) at time t years is given by the formula $r(t) = 2^{-0.002588t}$. How long will it take until only one-half kilogram of the radioactive substance is left in the box? 60) _____

A) 3863.99 yr B) 772.80 yr C) 386.40 yr D) 193.20 yr

Find the simple interest and amount for the value of principal P, rate r per year, and time t.

61) P = $6000, r = 9%, t = 4 years 61) _____

A) $2160, $3840 B) $21,600, $27,600

C) $2160, $8160 D) $216, $6216

Use the compound interest formula to determine the interest earned in the given period.

62) P = $4280 at 8.5% compounded monthly for 6 years 62) _____

A) $7114.64 B) $11,394.64 C) $2834.64 D) $7504.62

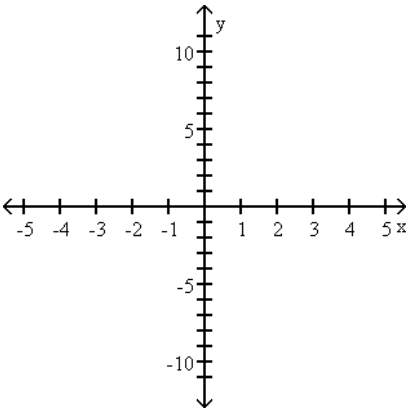
Find the principal P that will generate the given future value A.

63) A = $10,000 at 6% compounded continuously for 8 years. 63) _____

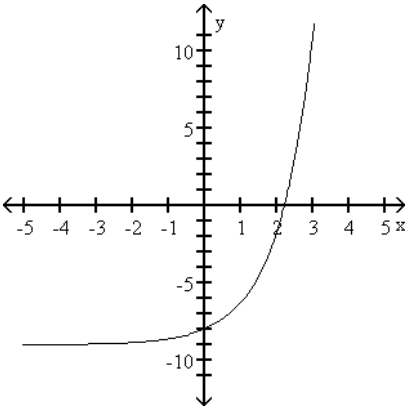
A) $6187.83 B) $16,160.74 C) $9417.65 D) $6209.93

Graph the function.

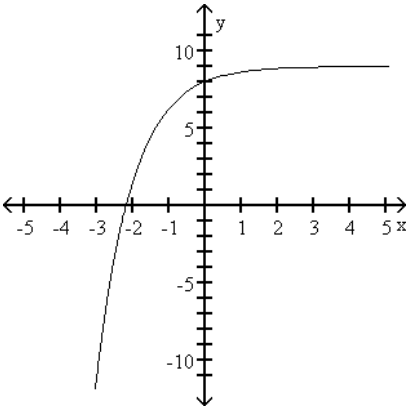
64) $f(x) = e^x - 9$ 64) _____



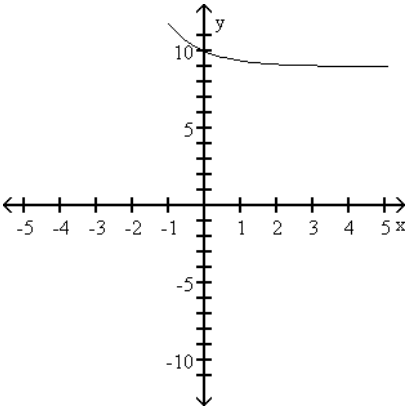
A)



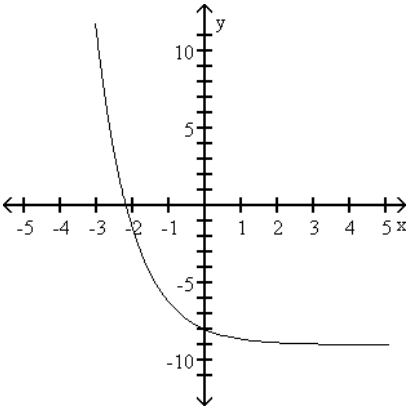
B)



C)



D)



Start with the graph of $y = e^x$.

a) Describe a sequence of transformations that results in the graph of $y = f(x)$;

b) Find the range of $f(x)$;

c) Find the horizontal asymptote of the graph of f.

65) $f(x) = e^{5x} - 5$ 65) _____

A) a) The graph of $y = e^x$ is compressed horizontally by a factor of 5 and shifted down five units.
b) $(-5, \infty)$
c) $y = -5$

B) a) The graph of $y = e^x$ is stretched horizontally by a factor of $\frac{1}{5}$ and shifted up five units.
b) $(5, \infty)$
c) $y = 5$

C) a) The graph of $y = e^x$ is compressed horizontally by a factor of $\frac{1}{5}$ and shifted down five units.
b) $(-5, \infty)$
c) $y = -5$

D) a) The graph of $y = e^x$ is compressed vertically by a factor of $\frac{1}{5}$ and shifted down five units.
b) $(-5, \infty)$
c) $y = -5$

Solve the problem.

66) Susan purchased a painting in the year 2000 for $5000. Assuming an exponential rate of inflation of 3.1% per year, how much will the painting be worth 5 years later? 66) _____

A) $9176.03 B) $4891.02 C) $7812.90 D) $5838.29

67) A bacterial culture has an initial population of 10,000. If its population declines to 7000 in 2 hours, what will it be at the end of 4 hours? Assume that the population decreases according to the exponential model. 67) _____

A) 1500 B) 4900 C) 2450 D) 9031

Convert to a logarithmic equation.

68) $16^{1/2} = 4$ 68) _____

A) $\frac{1}{2} = \log_{16} 4$ B) $4 = \log_{16} \frac{1}{2}$ C) $\frac{1}{2} = \log_4 16$ D) $4 = \log_{1/2} 16$

69) $10^{0.9542} = 9$ 69) _____

A) $9 = \log_{10} 0.9542$ B) $0.9542 = \log_9 10$ C) $10 = \log_9 0.9542$ D) $0.9542 = \log_{10} 9$

Convert to an exponential equation.

70) $\log_4 64 = t$ 70) _____

A) $t^4 = 64$ B) $4^t = 64$ C) $64^t = 4$ D) $4^{64} = t$

71) $\ln 42 = 3.7377$ 71) _____

A) $e^{3.7377} = \ln 42$ B) $e^{3.7377} = 1$ C) $e^{3.7377} = 42$ D) $e^{42} = 3.7377$

Evaluate the expression without a calculator.

72) $\log_{22}\sqrt{22}$ 72) _____

A) 2 B) - 2 C) $\frac{1}{2}$ D) $-\frac{1}{2}$

Solve the logarithmic equation.

73) $\log_3(9x - 6) = 2$ 73) _____

A) $\frac{15}{8}$ B) 6 C) $\frac{\log_3 2 + 6}{9}$ D) $\frac{5}{3}$

74) $\log_{27}\sqrt{x - 2} = \frac{1}{3}$ 74) _____

A) 11 B) 387,420,491 C) 7 D) 142.296115

Find the domain and the vertical asymptote of the function.

75) $g(x) = \ln(x - 4)$ 75) _____

A) Domain: $(-4, \infty)$; vertical asymptote: $x = -4$
B) Domain: $(4, \infty)$; vertical asymptote: $x = 4$
C) Domain: $(-\infty, \infty)$; vertical asymptote: none
D) Domain: $(0, \infty)$; vertical asymptote: $x = 0$

Evaluate.

76) Given that $\log_a 5 = 1.609$, and $\log_a 7 = 1.946$, find $\log_a \frac{5}{7}$. 76) _____

A) 3.555 B) 0.336 C) 0.827 D) -0.337

77) Let $\log_b A = 3.359$ and $\log_b B = 0.199$. Find $\log_b AB$. 77) _____

A) 16.837 B) 3.558 C) 3.159 D) 0.670

78) Given that $\log x = 3$ and $\log y = 6$, find $\log xy^4$. 78) _____

A) 27 B) 3888 C) 72 D) 36

Write the expression in expanded form.

79) $\log_b \sqrt{\frac{x^4y^2}{z^7}}$ 79) _____

A) $2\log_b x \cdot \log_b y \div \frac{7}{2}\log_b z$ B) $2\log_b x - \log_b y + \frac{7}{2}\log_b z$

C) $2\log_b x + \log_b y - \frac{7}{2}\log_b z$ D) $2\log_b x + 2\log_b y - 7\log_b z$

80) $\ln\left[\dfrac{x^4(5x+2)^5}{\sqrt{x^3+3}(x-3)^{-2}(x+5)^5}\right]$ 80) _____

A) $4\ln x + 5\ln(5x+2) - \dfrac{1}{2}\ln(x^3+3) - 2\ln(x-3) + 5\ln(x+5)$

B) $4\ln x + 5\ln(5x+2) - \dfrac{1}{2}\ln(x^3+3) + 2\ln(x-3) - 5\ln(x+5)$

C) $\ln(x^4(5x+2)^5) - \ln(\sqrt{x^3+3}(x-3)^{-2}(x+5)^5)$

D) $\ln x^4 + \ln(5x+2)^5 - \ln\sqrt{x^3+3} + \ln(x-3)^2 - \ln(x+5)^5$

Write the expression in condensed form.

81) $\ln x - 3[4\ln(x-4) - \ln(x+4)]$ 81) _____

A) $\ln\dfrac{x(x-4)^3}{(x+4)^4}$ B) $\ln\dfrac{x(x+4)^3}{(x-4)^{12}}$ C) $\ln\dfrac{x(x+4)^4}{(x-4)^3}$ D) $\ln\dfrac{x(x+4)^4}{(x-4)^4}$

82) $4\ln\sqrt{x^3} - 5\ln\sqrt[5]{y^4}$ 82) _____

A) $\ln\dfrac{15x^4}{8y^5}$ B) $\ln\dfrac{x^6}{y^4}$ C) $\ln\dfrac{4x^{3/2}}{5y^{4/5}}$ D) $\ln(x^6 - y^4)$

Use the change-of-base formula and a calculator to evaluate each logarithm.

83) $\log_8 18.06$ 83) _____

A) 0.7186 B) 1.2567 C) 2.2575 D) 1.3916

Find the value of the expression without using a calculator.

84) $\log 20 + \log 50$ 84) _____

A) 1000 B) 1 C) 3 D) 10

Solve the problem.

85) Find the exponential function of the form $f(x) = ae^{bx}$ that passes through the points (0, 3) and (3, 9). 85) _____

A) $f(x) = 3e^{(3\ln 3)x}$ B) $f(x) = 3e^{[-(\ln 3)/3]x}$

C) $f(x) = 3e^{[(\ln 3)/3]x}$ D) $f(x) = 3e^{[(\ln(1/3))/3]x}$

86) A certain radioactive isotope has a half-life of approximately 1600 years. How many years to the nearest year would be required for a given amount of this isotope to decay to 25% of that amount? 86) _____

A) 3200 yr B) 3175 yr C) 664 yr D) 1200 yr

Solve the equation.

87) $4^{(x-2)} = 1$ 87) _____

A) 6 B) 2 C) 0 D) 3

88) $\dfrac{1}{5}\log(x+8) - 1 = 0$ 88) _____

A) 100,008 B) 99,992 C) -3 D) 999,992

Solve the exponential equation and approximate the result, correct to three decimal places.

89) $e^x + e^{-x} = 4$ 89) _____

A) 0.9115, -1.7224 B) 1.4436, -1.4436 C) 1.297, -1.0739 D) 1.317, -1.317

90) $5^{(3x - 1)} = 24$ 90) _____

A) 0.992 B) 1.933 C) 0.856 D) 0.325

91) $4 \cdot 3^x - 2 = 13$ 91) _____

A) 0.921 B) 1.090 C) 1.203 D) 1.509

92) $3^{2x} - 4 \cdot 3^x = 21$ 92) _____

A) 1.771 B) 0.254 C) 1.000 D) $\varnothing$

Solve the logarithmic equation.

93) $\log_6(6x - 5) = 3$ 93) _____

A) $\frac{221}{6}$ B) 215 C) $\frac{\log_6 3 + 5}{6}$ D) $\frac{221}{8}$

94) $\log_4(x + 8) + \log_4(x - 8) = 3$ 94) _____

A) 128 B) $8\sqrt{2}$ C) $\frac{64}{3}$ D) $\frac{259}{4}$

Find a and k and then evaluate the function. Round your answer to three decimal places when necessary.

95) Let $f(x) = 10 + a(2^{kx})$ with $f(0) = 60$ and $f(1) = 410$. Find $f(2)$. 95) _____

A) a = 50, k = 3, f(2) = 3200 B) a = 50, k = 3, f(2) = 3210

C) a = 5, k = 3, f(2) = 330 D) a = 50, k = 3, f(2) = 74

96) $f(x) = \frac{9}{2 + ae^{kx}}$ with $f(0) = 3$ and $f(1) = \frac{1}{3}$. Find $f(2)$. 96) _____

A) a = 1, k = ln (19), f(2) = 0.025 B) a = <-b>, k = ln (25), f(2) = 0.014

C) a = 1, k = ln (17), f(2) = 0.031 D) a = 1, k = ln (25), f(2) = 0.014

Solve the problem.

97) The energy E (measured in joules) released by an earthquake of magnitude M on the Richter scale 97) _____

$m = \log\left(\frac{I}{I_0}\right)$ is given by the equation $\log E = 4.4 + 1.5M$. Suppose an earthquake registers 5.7 on the Richter scale. Let $I_0 = 1$. What is the intensity of the earthquake?

A) $I = 10^{12.95}$ B) $I = 5.7^{10}$ C) $I = 12.95^{10}$ D) $I = 10^{5.7}$

The given angle is in standard position. Determine the quadrant in which the angle lies.

98) -349° 98) _____

A) Quadrant II B) Quadrant IV C) Quadrant III D) Quadrant I

Convert the angle in degrees to radians. Round to two decimal places.

99) 138° 99) _____

A) 2.38 radians B) 2.4 radians C) 2.41 radians D) 2.39 radians

100) A pendulum swings through an angle of 30° each second. If the pendulum is 55 inches long, how far does its tip move each second? If necessary, round the answer to two decimal places. 100) _____

A) 26.95 inches B) 31.23 inches C) 28.8 inches D) 30.09 inches

101) A surveyor is measuring the distance across a small lake. He has set up his transit on one side of the lake 90 feet from a piling that is directly across from a pier on the other side of the lake. From his transit, the angle between the piling and the pier is 35°. What is the distance between the piling and the pier to the nearest foot? 101) _____

A) 63 feet B) 129 feet C) 74 feet D) 52 feet

102) A radio transmission tower is 210 feet tall. How long should a guy wire be if it is to be attached 8 feet from the top and is to make an angle of 25° with the ground? Give your answer to the nearest tenth of a foot. 102) _____

A) 496.9 feet B) 222.9 feet C) 478.0 feet D) 231.7 feet

In questions 130, 131, find the reference angle for the given angle.

103) -404° 103) _____

A) 136° B) 134° C) 46° D) 44°

104) $\frac{-61\pi}{6}$ 104) _____

A) $\frac{\pi}{6}$ B) $\frac{49\pi}{6}$ C) $\frac{5\pi}{6}$ D) $\frac{-\pi}{6}$

105) Suppose that the average monthly low temperatures for a small town are shown in the table. 105) _____

Month	1	2	3	4	5	6	7	8	9	10	11	12
Temperature (°F)	19	27	38	45	57	62	65	58	51	41	33	25

Model this data using f(x) = a sin(b(x - c)) + d. Use the sine regression feature to do this. Approximate all values to one decimal place.

A) f(x) = 22.5sin (0.5(x + 3.2)) + 40.7 B) f(x) = 22.5sin (0.5(x + 1.6)) + 40.7

C) f(x) = 22.5sin (1.25(x + 1.6)) + 40.7 D) f(x) = 25.7sin (0.5(x + 1.6)) + 32.5

In questions 134, 135, use a right triangle to write the expression as an algebraic expression. Assume that x is positive and in the domain of the given inverse trigonometric function.

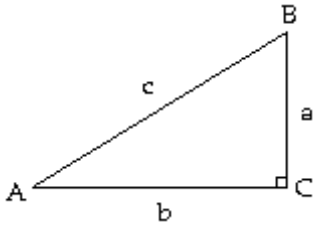
106) $\sin(\tan^{-1} x)$ 106) _____

A) $\frac{x\sqrt{x^2 - 1}}{x^2 - 1}$ B) $x\sqrt{x^2 + 1}$ C) $\frac{x\sqrt{x^2 + 1}}{x^2 + 1}$ D) $\frac{\sqrt{x^2 + 1}}{x^2 + 1}$

107) $\sin(\sin^{-1} \frac{x}{\sqrt{3}})$ 107) _____

A) $\frac{x\sqrt{3}}{3}$ B) $\frac{\sqrt{x^2 + 3}}{x^2 + 3}$ C) $x\sqrt{3}$ D) $\frac{x\sqrt{x^2 - 3}}{x^2 - 3}$

Solve the right triangle shown in the figure. Round lengths to one decimal place and express angles to the nearest tenth of a degree.



108) A = 33°, b = 45.2 108) _____

A) B = 57°, a = 29.4, c = 53.9 B) B = 33°, a = 69.6, c = 37.9

C) B = 33°, a = 37.9, c = 29.4 D) B = 57°, a = 69.6, c = 83

In questions 138, 139, 140, complete the identity.

109) $\sec x - \frac{1}{\sec x} = ?$ 109) _____

A) $-2 \tan^2 x$ B) $1 + \cot x$ C) $\sec x \csc x$ D) $\sin x \tan x$

110) $\sec^4 x + \sec^2 x \tan^2 x - 2 \tan^4 x = ?$ 110) _____

A) $\sec^4 x + 2$ B) $4 \sec^4 x$ C) $3 \sec^4 x - 2$ D) $\tan^2 x - 1$

111) $\frac{\cos x - \sin x}{\cos x} + \frac{\sin x - \cos x}{\sin x} = ?$ 111) _____

A) $\sec x \csc x$ B) $2 - \sec x \csc x$ C) $2 + \sec x \csc x$ D) $1 - \sec x \csc x$

Write the expression as the cosine of an angle, knowing that the expression is the right side of the formula for $\cos(\alpha - \beta)$ with particular values for α and β.

112) $\cos(155°) \cos(35°) + \sin(155°) \sin(35°)$ 112) _____

A) $\cos(120°)$ B) $\cos(210°)$ C) $\cos(220°)$ D) $\cos(190°)$

In questions 142, 143, use the given information to find the exact value of the expression.

113) $\sin \alpha = \frac{3}{5}$, α lies in quadrant II, and $\cos \beta = \frac{2}{5}$, β lies in quadrant I Find $\cos(\alpha - \beta)$. 113) _____

A) $\frac{6 - 4\sqrt{21}}{25}$ B) $\frac{6 + 4\sqrt{21}}{25}$ C) $\frac{8 - 3\sqrt{21}}{25}$ D) $\frac{-8 + 3\sqrt{21}}{25}$

114) $\tan \alpha = \frac{12}{5}$, α lies in quadrant III, and $\cos \beta = -\frac{20}{29}$, β lies in quadrant II Find $\sin(\alpha + \beta)$. 114) _____

A) $\frac{352}{377}$ B) $\frac{135}{377}$ C) $-\frac{152}{377}$ D) $\frac{345}{377}$

Find the exact value under the given conditions.

115) $\sin \alpha = \frac{24}{25}$, $0 < \alpha < \frac{\pi}{2}$; $\cos \beta = \frac{20}{29}$, $0 < \beta < \frac{\pi}{2}$ Find $\tan(\alpha + \beta)$. 115) _____

A) $\frac{644}{725}$ B) $-\frac{627}{364}$ C) $\frac{627}{725}$ D) $-\frac{364}{725}$

In quesrtions 145, 146, 147, use the given information to find the exact value of the trigonometric function.

116) $\sin\theta = \frac{1}{4}$, θ lies in quadrant I Find $\sin\frac{\theta}{2}$. 116) _____

A) $\frac{\sqrt{8+2\sqrt{15}}}{4}$ B) $\frac{\sqrt{6}}{4}$ C) $\frac{\sqrt{8-2\sqrt{15}}}{4}$ D) $\frac{\sqrt{10}}{4}$

117) $\cos\theta = \frac{1}{4}$, $\csc\theta > 0$ Find $\sin\frac{\theta}{2}$. 117) _____

A) $\frac{\sqrt{8+2\sqrt{15}}}{4}$ B) $\frac{\sqrt{8-2\sqrt{15}}}{4}$ C) $\frac{\sqrt{6}}{4}$ D) $\frac{\sqrt{10}}{4}$

Complete the identity.

118) $\frac{\sin 5x + \sin 11x}{\cos 5x + \cos 11x} = ?$ 118) _____

A) tan 8x cot 3x B) tan 5x + tan 11x C) tan 8x D) 2 tan 8x tan 3x

In questions 149, 150, 151, find all solutions of the equation.

119) $\tan x = \frac{\sqrt{3}}{3}$ 119) _____

A) $x = \frac{2\pi}{3} + 2n\pi$ B) $x = \frac{5\pi}{6} + n\pi$ C) $x = \frac{5\pi}{6} + 2n\pi$ D) $x = \frac{\pi}{6} + n\pi$

120) $5\sin x - 8\sqrt{2} = 3\sin x - 7\sqrt{2}$ 120) _____

A) $x = \frac{5\pi}{4} + n\pi$ or $x = \frac{7\pi}{4} + n\pi$ B) $x = \frac{\pi}{4} + 2n\pi$ or $x = \frac{3\pi}{4} + 2n\pi$

C) $x = \frac{\pi}{4} + n\pi$ or $x = \frac{3\pi}{4} + n\pi$ D) $x = \frac{5\pi}{4} + 2n\pi$ or $x = \frac{7\pi}{4} + 2n\pi$

In Questions 152, 153, 154, 155, solve the equation on the interval $[0, 2\pi)$.

121) $\cos 2x = \frac{\sqrt{3}}{2}$ 121) _____

A) $\frac{\pi}{2}$ B) $\frac{3\pi}{2}$

C) $\frac{\pi}{6}, \frac{11\pi}{6}$ D) $\frac{\pi}{12}, \frac{11\pi}{12}, \frac{13\pi}{12}, \frac{23\pi}{12}$

122) $\tan 2x - \tan x = 0$ 122) _____

A) 0 B) 0, π

C) $\frac{\pi}{12}, \frac{\pi}{6}, \frac{2\pi}{3}, \frac{7\pi}{12}, \frac{7\pi}{6}, \frac{13\pi}{12}, \frac{5\pi}{3}$ D) $\frac{\pi}{4}, \frac{5\pi}{4}$

123) A generator produces an alternating current according to the equation $I = 48\sin 122\pi t$, where t is time in seconds and I is the current in amperes. What is the smallest time t such that I = 24? 123) _____

A) $\frac{1}{366}$ second B) $\frac{1}{244}$ second C) $\frac{1}{488}$ second D) $\frac{1}{732}$ second

124) The range r of a projectile is given by $r = \frac{1}{32}v^2 \sin 2\theta$, where v is the initial velocity and θ is the angle of elevation. If r is to be 3000 ft and v = 500 ft/sec, what must the angle of elevation be? Give your answer in degrees to the nearest hundredth. 124) _____

A) 22.58° B) 11.29° C) 78.71° D) 15.81°

Solve the triangle. Round lengths to the nearest tenth and angle measures to the nearest degree.

125) B = 15°
C = 113°
b = 49 125) _____

A) A = 50°, a = 174.3, c = 149.2
B) A = 52°, a = 149.2, c = 174.3
C) A = 50°, a = 176.3, c = 151.2
D) A = 52°, a = 151.2, c = 176.3

Two sides and an angle (SSA) of a triangle are given. Determine whether the given measurements produce one triangle, two triangles, or no triangle at all. Solve each triangle that results. Round lengths to the nearest tenth and angle measures to the nearest degree.

126) B = 70°, b = 2, c = 3 126) _____

A) C = 34°, A = 76°, a = 7
B) no triangle
C) B = 35°, A = 75°, a = 5
D) C = 36°, A = 74°, a = 9

127) A guy wire to a tower makes a 67° angle with level ground. At a point 33 ft farther from the tower than the wire but on the same side as the base of the wire, the angle of elevation to the top of the tower is 38°. Find the length of the wire (to the nearest foot). 127) _____

A) 84 feet B) 47 feet C) 89 feet D) 42 feet

Solve the triangle. Round lengths to the nearest tenth and angle measures to the nearest degree.

128) A = 11.2°, C = 131.6°, a = 97.2 128) _____

A) B = 37.2°, b = 31.2, c = 25.4
B) B = 36.8°, b = 299.8, c = 374.2
C) B = 37.2°, b = 302.6, c = 374.2
D) B = 37.2°, b = 374.2, c = 302.6

129) A painter needs to cover a triangular region 60 meters by 68 meters by 71 meters. A can of paint covers 70 square meters. How many cans will be needed? 129) _____

A) 3 cans B) 27 cans C) 14 cans D) 308 cans