MAC 1105 Fall 2007 - Final Exam
Dr. Schnackenberg

If you do not agree with the given answers, answer "E" for "None of the above".

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

Solve the exponential equation. Use a calculator to obtain a decimal approximation, correct to two decimal places, for the solution.

1) $2^x - 4x - 1 = 0$ 1) _____

A) 4.131 B) 0.000, 4.131 C) 0.000 D) 17.526

Solve the system by the method of your choice. Identify systems with no solution and systems with infinitely many solutions, using set notation to express their solutions.

2) $x + 2y = -4$
$-5x - 10y = 20$ 2) _____

A) {(-4, 0)} B) ∅

C) {(x, y) | x + 2y = -4} D) {(0, 0)}

Use the compound interest formulas $A = P\left(1 + \frac{r}{n}\right)^{nt}$ and $A = Pe^{rt}$ to solve.

3) Find the accumulated value of an investment of $1000 at 12% compounded semiannually for 11 years. 3) _____

A) $3603.54 B) $1898.30 C) $2320.00 D) $3478.55

Evaluate the exponential expression.

4) 5^{-2} 4) _____

A) $\frac{1}{25}$ B) $\frac{1}{10}$ C) -25 D) 25

Solve the system by the addition method.

5) $6x + 3y = 51$
$2x - 6y = 38$ 5) _____

A) {(-3, 10)} B) {(10, -3)} C) {(-10, 3)} D) {(3, -10)}

6) $x^2 + y^2 = 4$
$x^2 - y^2 = 4$ 6) _____

A) {(2, 0), (-2, 0)} B) {(2, 2), (-2, 2)} C) {(2, 0), (2, 2)} D) {(-2, 0), (-2, 2)}

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

7) $f(x) = \frac{5}{7x - 6}$ 7) _____

A) $f^{-1}(x) = \frac{7x - 6}{5}$ B) $f^{-1}(x) = \frac{5}{7y} + \frac{6}{7}$

C) $f^{-1}(x) = -\frac{6}{7} - \frac{5}{7x}$ D) $f^{-1}(x) = \frac{5}{7x} + \frac{6}{7}$

Determine the slope and the y-intercept of the graph of the equation.

8) $x + 12y - 1 = 0$ 8) _____

A) m = 1; (0, 1)

B) $m = \frac{1}{12}; \left(0, \frac{1}{12}\right)$

C) m = -12; (0, 12)

D) $m = -\frac{1}{12}; \left(0, \frac{1}{12}\right)$

Solve the problem.

9) The cost in millions of dollars for a company to manufacture x thousand automobiles is given by the function $C(x) = 4x^2 - 32x + 128$. Find the number of automobiles that must be produced to minimize the cost. 9) _____

A) 8 thousand automobiles

B) 64 thousand automobiles

C) 4 thousand automobiles

D) 16 thousand automobiles

10) A machine produces open boxes using square sheets of plastic. The machine cuts equal-sized squares measuring 4 inches on a side from each corner of the sheet, and then shapes the plastic into an open box by turning up the sides. If each box must have a volume of 1600 cubic inches, find the length of one side of the open box. 10) _____

A) 20 in. B) 24 in. C) 28 in. D) 19 in.

11) One number is 2 less than a second number. Twice the second number is 24 more than 4 times the first. Find the two numbers. 11) _____

A) -11 and -9 B) -10 and -8 C) 8 and 10 D) -9 and -7

12) The function $A = A_0e^{-0.01155x}$ models the amount in pounds of a particular radioactive material stored in a concrete vault, where x is the number of years since the material was put into the vault. If 800 pounds of the material are placed in the vault, how much time will need to pass for only 356 pounds to remain? 12) _____

A) 75 years B) 140 years C) 80 years D) 70 years

13) A steel company produces two types of machine dies, part A and part B. The company makes a $2.00 profit on each part A that it produces and a $6.00 profit on each part B that it produces. Let x = the number of part A produced in a week and y = the number of part B produced in a week. Write the objective function that describes the total weekly profit. 13) _____

A) z = 6x + 2y

B) z = 8(x + y)

C) z =2(x - 6) + 6(y - 2)

D) z = 2x + 6y

14) The logistic growth function $f(t) = \frac{800}{1 + 12.3e^{-0.14t}}$ describes the population of a species of butterflies t months after they are introduced to a non-threatening habitat. How many butterflies are expected in the habitat after 13 months? 14) _____

A) 780 butterflies

B) 10,400 butterflies

C) 802 butterflies

D) 267 butterflies

15) A right triangle has an area of 9 square inches. The square of the hypotenuse is 85. Find the lengths of the legs of the triangle. Round your answer to the nearest inch. 15) _____

A) 4 inches and 81 inches
B) 2 inches and 9 inches
C) 1 inches and 18 inches
D) 4 inches and 4.5 inches

16) The formula $A = 255e^{0.022t}$ models the population of a particular city, in thousands, t years after 1998. When will the population of the city reach 339 thousand? 16) _____

A) 2013 B) 2014 C) 2011 D) 2012

17) The population in a particular country is growing at the rate of 2.8% per year. If 8,911,000 people lived there in 1999, how many will there be in the year 2002? Use $f(x) = y_0e^{0.028t}$ and round to the nearest ten-thousand. 17) _____

A) 11,630,000 B) 9,690,000 C) 10,660,000 D) 9,500,000

18) A vineyard produces two special wines, a white and a red. A bottle of the white wine requires 14 pounds of grapes and 1 hour of processing time. A bottle of red wine requires 25 pounds of grapes and 2 hours of processing time. The vineyard has on hand 2,198 pounds of grapes and can allot 160 hours of processing time to the production of these wines. A bottle of the white wine sells for $11.00, while a bottle of the red wine sells for $20.00. How many bottles of each type should the vineyard produce in order to maximize gross sales? 18) _____

A) 132 bottles of white and 14 bottles of red
B) 14 bottles of white and 132 bottles of red
C) 42 bottles of white and 59 bottles of red
D) 76 bottles of white and 42 bottles of red

Solve the equation by isolating the natural logarithm and exponentiating both sides. Express the answer in terms of e.

19) $7 + 6 \ln x = 10$ 19) _____

A) $\{e^{1/2}\}$ B) $\left\{\ln\left(\frac{1}{2}\right)\right\}$ C) $\left\{\frac{e^3}{6}\right\}$ D) $\left\{\frac{3}{6 \ln 1}\right\}$

Solve the logarithmic equation. Be sure to reject any value of x that produces the logarithm of a negative number or the logarithm of 0.

20) $\log_2 (x + 4) = 2 + \log_2 (x - 4)$ 20) _____

A) $\{\frac{20}{3}\}$ B) $\{-\frac{20}{3}\}$ C) $\{\frac{8}{3}\}$ D) $\{-\frac{8}{3}\}$

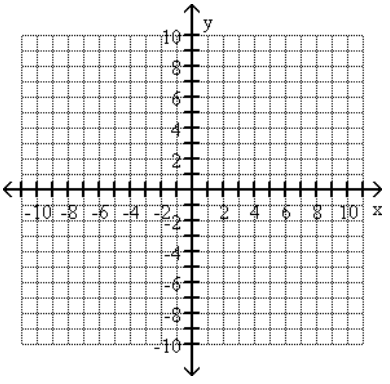
Solve and check the equation.

21) $(x + 7)^{3/2} = 27$ 21) _____

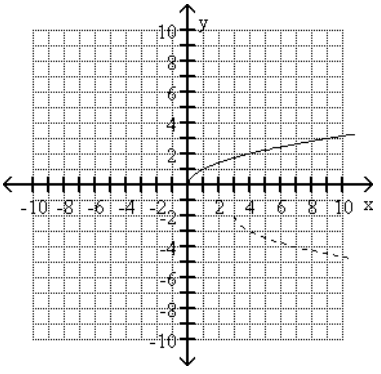
A) 2 B) -4 C) $\sqrt[3]{3} - 7$ D) 16

Begin by graphing the standard square root function $f(x) = \sqrt{x}$. Then use transformations of this graph to graph the given function.

22) $g(x) = -\sqrt{x} - 2$ 22) _____



A)



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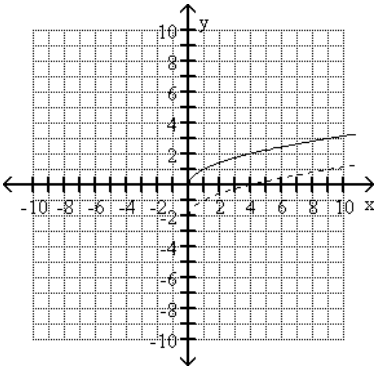

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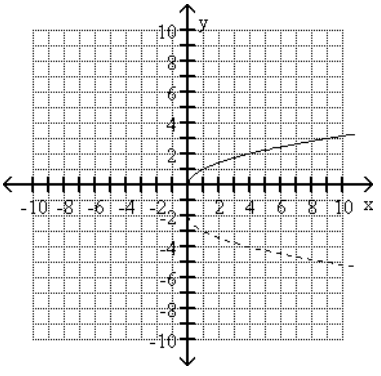

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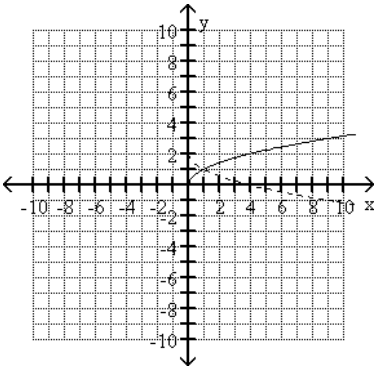
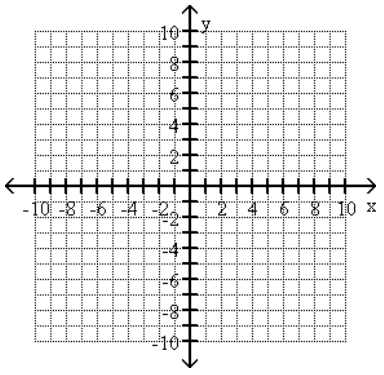
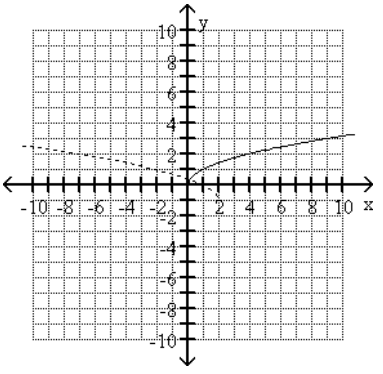


23) $h(x) = \sqrt{-x + 2} - 1$ 23) _____



A)



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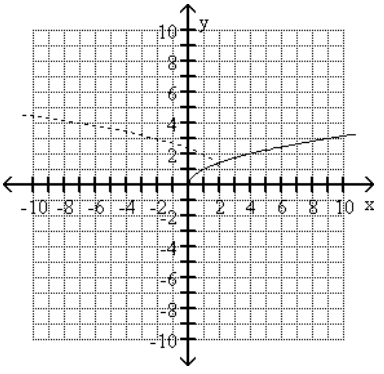

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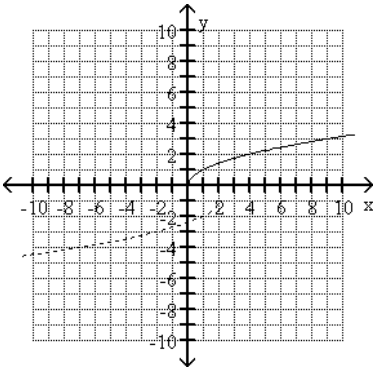

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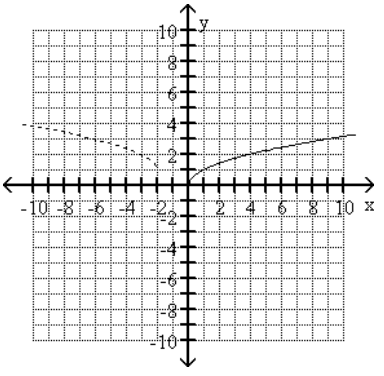
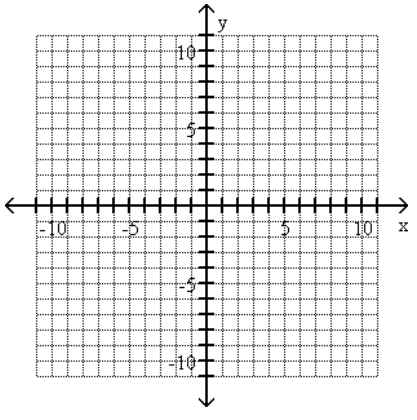
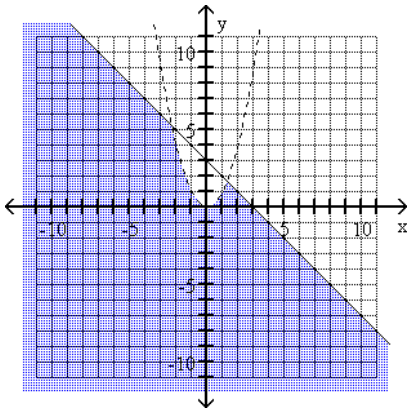


Graph the solution set of the system of inequalities or indicate that the system has no solution.

24) $y > x^2$
$3x + 3y \leq 9$ 24) _____



A)



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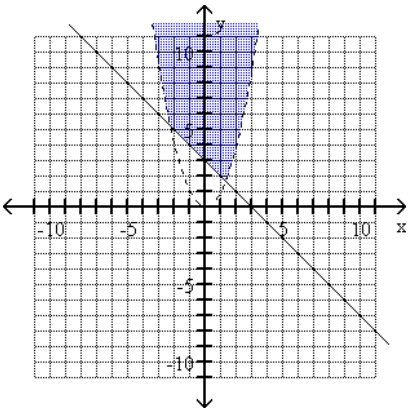

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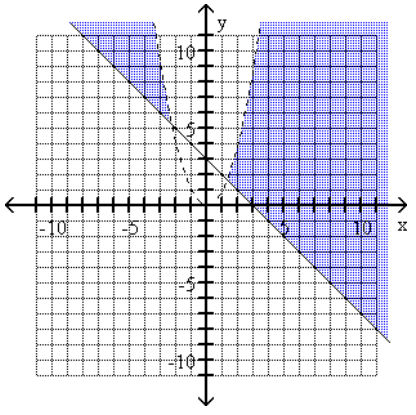

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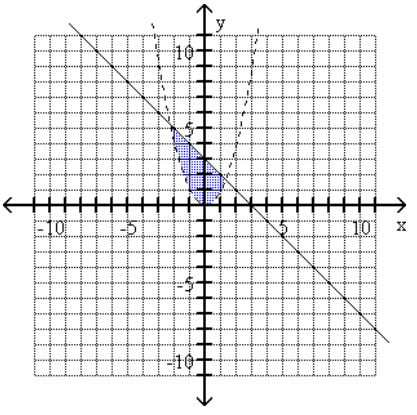


Solve the system by the substitution method.

25) $5x - 2y = -1$
$x + 4y = 35$ 25) _____

A) {(3, 9)} B) {(2, 9)} C) {(3, 8)} D) {(2, 8)}

26) $xy = 6$
$x + y = 5$ 26) _____

A) {(3, 2), (2, 3)} B) {(3, -2), (2, -3)}
C) {(-3, 2), (-2, 3)} D) {(-3, -2), (-2, -3)}

Solve the equation by making an appropriate substitution.

27) $(x^2 - 2x)^2 - 23(x^2 - 2x) + 120 = 0$ 27) _____

A) {- 3, - 2, 5, 4} B) {15, 8}
C) {- 3, 5} D) {- 3, - 2, 15, 8, 5, 4}

Solve the equation by factoring.

28) $x^2 = x + 42$ 28) _____

A) {6, 7} B) {-6, 7} C) {-6, -7} D) {1, 42}

Use the given conditions to write an equation for the line in the indicated form.

29) Passing through (2, 5) and parallel to the line whose equation is $y = -2x + 3$; point-slope form 29) _____

A) $y - 2 = -2(x - 5)$ B) $y = 2x$ C) $y - 5 = x - 2$ D) $y - 5 = -2(x - 2)$

Use the given conditions to write an equation for the line in slope-intercept form.

30) Slope = $\frac{8}{9}$, passing through (7, 2) 30) _____

A) $y = \frac{8}{9}x + \frac{38}{9}$ B) $y = \frac{8}{9}x - \frac{38}{9}$ C) $y = mx - \frac{38}{9}$ D) $y = \frac{8}{9}x + 7$

Use the given conditions to write an equation for the line in the indicated form.

31) Passing through (4, 5) and perpendicular to the line whose equation is $-6x + y - 2 = 0$; slope-intercept form 31) _____

A) $y = -6x - 34$ B) $y = -\frac{1}{6}x - \frac{17}{3}$ C) $y = \frac{1}{6}x - \frac{17}{3}$ D) $y = -\frac{1}{6}x + \frac{17}{3}$

Write the equation in its equivalent logarithmic form.

32) $5^2 = y$ 32) _____

A) $\log_2 y = 5$ B) $\log_y 5 = 2$ C) $\log_5 y = 2$ D) $\log_y 2 = 5$

Find the coordinates of the vertex for the parabola defined by the given quadratic function.

33) $f(x) = -x^2 + 14x + 9$ 33) _____

A) (-7, -138) B) (14, 9) C) (7, 58) D) (-7, -40)

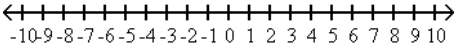
Solve the radical equation, and check all proposed solutions.

34) $\sqrt{3x + 18} = x$ 34) _____

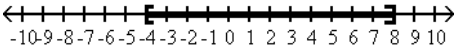
A) {- 9} B) {6} C) {-3, 6} D) ∅

Solve the inequality by first rewriting it as an equivalent inequality without absolute value bars. Graph the solution set on the number line. Express the solution set using interval notation.

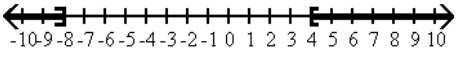
35) $5 + \left|1 - \frac{x}{2}\right| \geq 8$ 35) _____



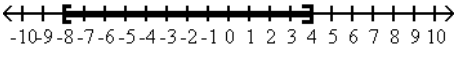
A) [-4, 8]



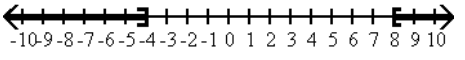
B) (-∞, -8] or [4, ∞)



C) [-8, 4]



D) (-∞, -4] or [8, ∞)



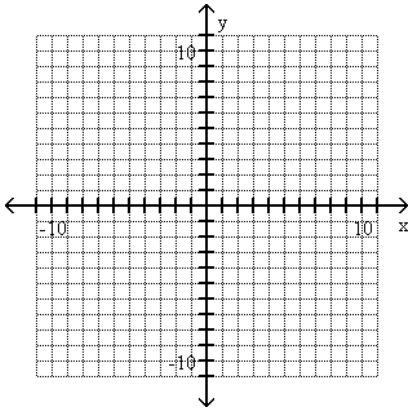
Perform the indicated operation and express the answer in decimal notation.

36) $\frac{49 \times 10^5}{7 \times 10^4}$ 36) _____

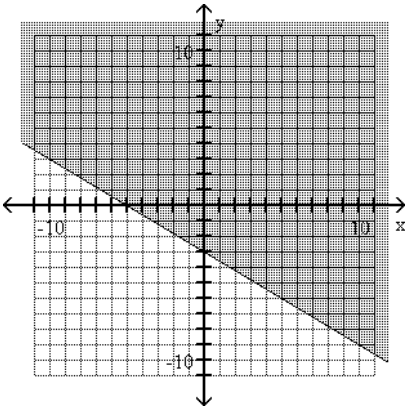
A) -0.7 B) 0.7 C) 70 D) -70

Graph the inequality.

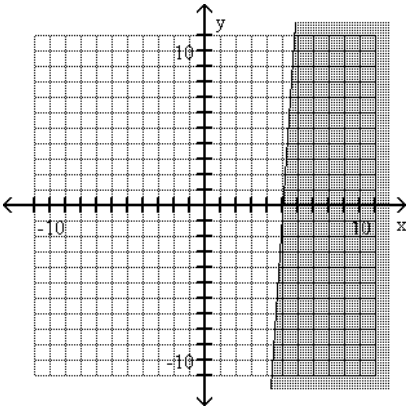
37) $-3x - 5y \leq 15$ 37) _____



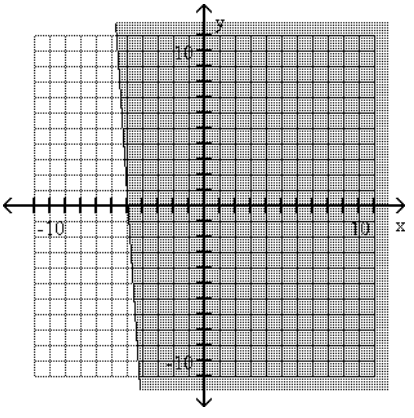
A)



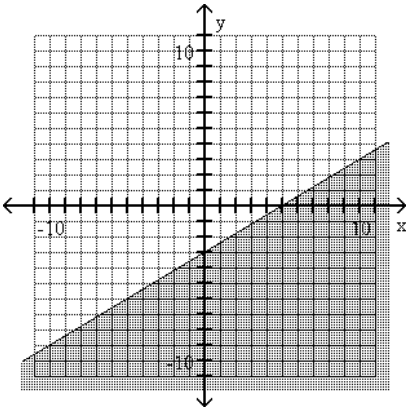
B)



C)



D)



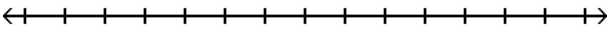
Evaluate the expression without using a calculator.

38) $\log_{25} 5$ 38) _____

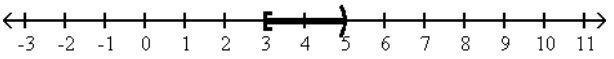
A) 10 B) $\frac{1}{2}$ C) 2 D) 1

Solve the inequality and graph the solution set on the number line. Express the solution set using interval notation.

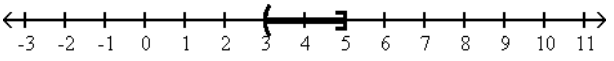
39) $-19 \le -3x - 4 < -13$ 39) _____



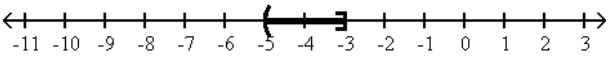
A) [3, 5)



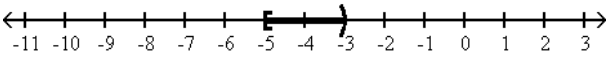
B) (3, 5]



C) (-5, -3]

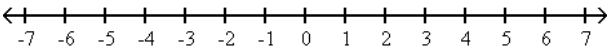


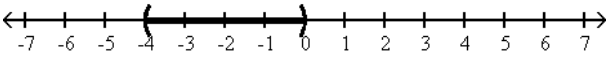
D) [-5, -3)

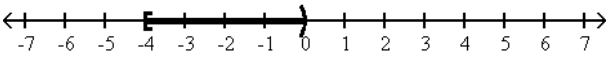


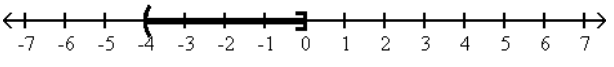
Graph the solutions of the inequality on a number line.

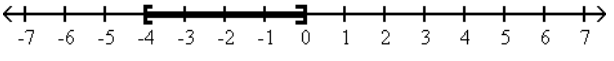
40) $-4 \le x < 0$ 40) _____



A) 

B) 

C) 

D) 

Write the equation in its equivalent exponential form.

41) $\log_b 81 = 4$ 41) _____

A) $81^b = 4$ B) $b^4 = 81$ C) $81^4 = b$ D) $4^b = 81$

Solve the exponential equation. Express the solution set in terms of natural logarithms.

42) $e^{2x} = 5$ 42) _____

A) $\left\{\frac{5}{2}e\right\}$ B) $\left\{\frac{\ln 5}{2}\right\}$ C) {2 ln 5} D) $\left\{\frac{\ln 2}{5}\right\}$

Simplify the exponential expression.

43) $(-3x^2y)(-10x^6y^5)$ 43) _____

A) $30x^8y^6$ B) $-30x^8y^5$ C) $30x^{12}y^5$ D) $-13x^8y^5$

Approximate the number using a calculator. Round your answer to three decimal places.

44) $3^{-1.1}$ 44) _____

A) -1.331 B) 0.599 C) -3.300 D) 0.299

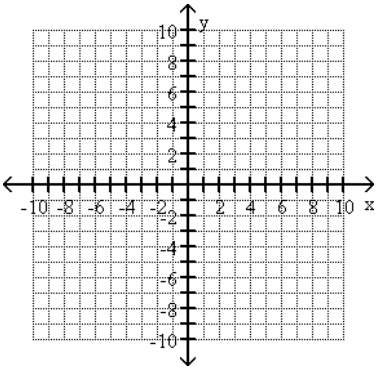
Find the domain of the logarithmic function.

45) $f(x) = \ln(8 - x)$ 45) _____

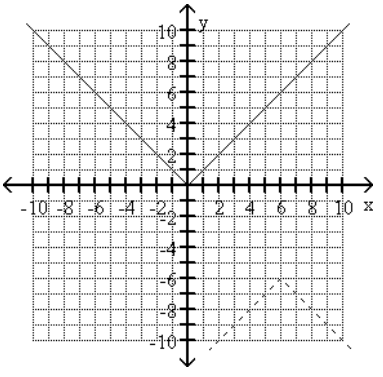
A) $(-\infty, 8)$ B) $(-\infty, 0)$ C) $(-\infty, 8)$ or $(8, \infty)$ D) $(-8, \infty)$

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

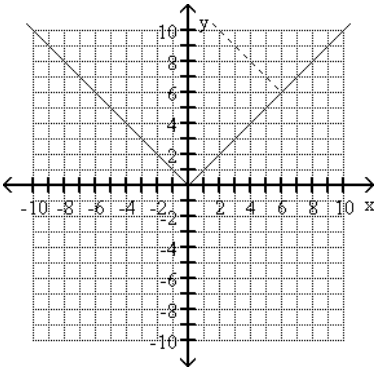
46) $h(x) = |x - 6| - 6$ 46) _____



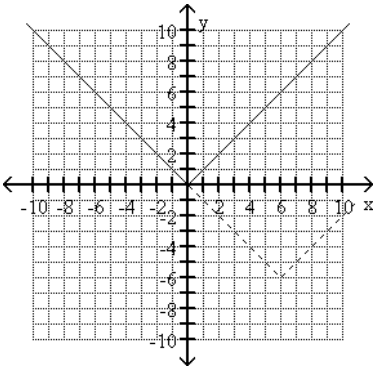
A)



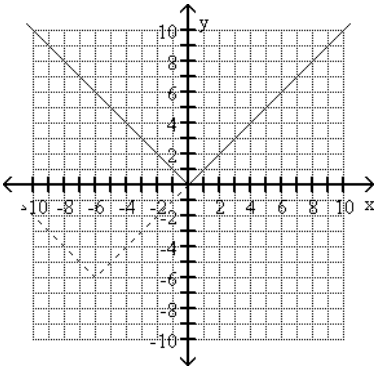
B)



C)

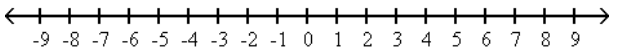


D)

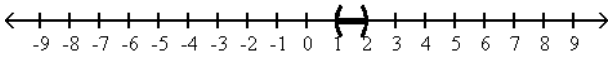


Solve the quadratic inequality and graph the solution set on a number line. Express the solution set in interval notation.

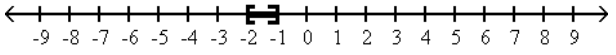
47) $x^2 + 3x \le -2$ 47) _____



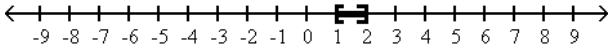
A) (1, 2)



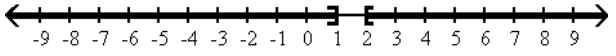
B) [-2, -1]



C) [1, 2]



D) $(-\infty, 1]$ or $[2, \infty)$



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

48) $f(x) = -4x + 5$, $g(x) = 3x + 9$ 48) _____

$(g \circ f)(x)$

A) -12x - 6 B) -12x + 24 C) -12x + 41 D) 12x + 24

Use the given conditions to write an equation for the line in point-slope form.

49) Passing through (5, 3) and (8, 7) 49) _____

A) $y - 3 = \frac{4}{3}(x - 8)$ or $y - 7 = \frac{4}{3}(x - 5)$

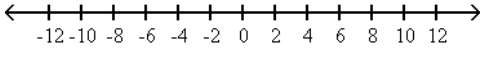
B) $y - 3 = 5(x + 5)$ or $y - 7 = 8(x - 3)$

C) $y - 3 = \frac{4}{3}(x - 5)$ or $y - 7 = \frac{4}{3}(x - 8)$

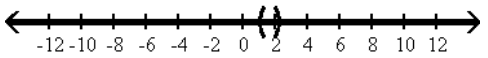
D) $y + 3 = \frac{4}{3}(x + 5)$ or $y + 7 = \frac{4}{3}(x + 8)$

Solve the rational inequality and graph the solution set on a real number line. Express the solution set in interval notation.

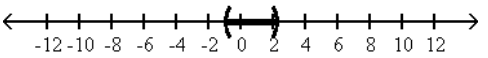
50) $\frac{x + 14}{x + 1} < 5$ 50) _____



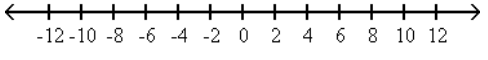
A) $(-\infty, \frac{9}{4})$ or $(1, \infty)$



B) $(-1, \frac{9}{4})$



C) $\emptyset$



D) $(-\infty, -1)$ or $(\frac{9}{4}, \infty)$