

# COLLEGE ALGEBRA AND TRIGONOMETRY

## MA125

# CUMULATIVE REVIEW

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

**Solve the problem.**

- 1) Let  $f(x)$  compute the time in hours to travel  $x$  miles at 25 miles per hour. What does  $f^{-1}(x)$  compute?
- A) The hours taken to travel  $x$  miles at 25 miles per hour
  - B) The hours taken to travel 25 miles
  - C) The miles traveled in  $x$  hours at 25 miles per hour
  - D) The miles traveled in 25 hours

**Find the quotient. Write the answer in standard form.**

2)  $\frac{3 - 9i}{5 - 7i}$

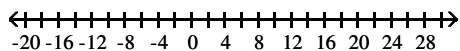
**Solve the equation.**

3)  $\frac{16}{x + 2} = 1 + \frac{2}{x - 4}$

4)  $\sqrt{3x + 1} = 3 + \sqrt{x - 4}$

**Solve and graph the inequality. Give answer in interval notation.**

5)  $\frac{x - 2}{25} \geq \frac{x - 5}{30} + \frac{1}{150}$



**Solve the equation.**

6)  $\sqrt[3]{5x^2 - 6x - 4} = \sqrt[3]{5x^2 + 8x + 7}$

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

7)  $|2 - 3x| \leq 11$

**Find the requested value.**

8)  $f(-9)$  for  $f(x) = \begin{cases} 4x + 1, & \text{if } x < 9 \\ 9x, & \text{if } 9 \leq x \leq 13 \\ 9 - 7x, & \text{if } x > 13 \end{cases}$

**Does the function have a maximum or minimum value? What is it? Find the domain and range of the function.**

9)  $f(x) = 3x^2 - 42x + 151$

Find the requested function value.

10) Find  $(g \circ f)(8)$  when  $f(x) = 6x - 7$  and  $g(x) = 5x^2 + 9x + 5$ .

Decide whether or not the functions are inverses of each other.

Hint: Determine whether  $(f \circ g)(x) = x$  and whether  $(g \circ f)(x) = x$ .

11)  $f(x) = 9x - 5$ ,  $g(x) = \frac{x+9}{5}$

Provide an appropriate response.

12) Find the supplement of an angle whose measure is  $37^\circ 39' 1''$

Solve the equation.

13)  $x^4 + 2000 = 141x^2$

Decide whether or not the functions are inverses of each other.

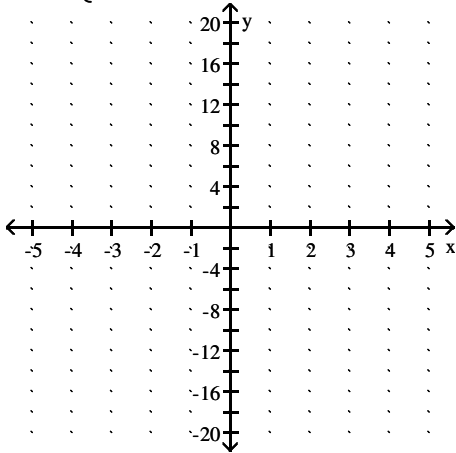
Hint: Determine whether  $(f \circ g)(x) = x$  and whether  $(g \circ f)(x) = x$ .

14)  $f(x) = \sqrt[5]{x-13}$ ,  $g(x) = x^5 + 13$

15)  $f(x) = \sqrt{x+1}$ ,  $g(x) = x^2$

Graph the function.

16)  $f(x) = \begin{cases} 2x^2, & \text{if } x \leq -1 \\ 2, & \text{if } -1 < x < 1 \\ 2x + 1, & \text{if } x \geq 1 \end{cases}$



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

17)  $f(x) = \frac{x}{9-x}$

Determine if the function is even, odd, or neither.

18)  $f(x) = -11x^8 + 4x^6$

**Simplify the power of i.**

19)  $i^{97}$

**Use the formula  $\omega = \frac{\theta}{t}$  to find the value of the missing variable.**

20)  $\theta = 60^\circ$ ,  $t = 8$  sec

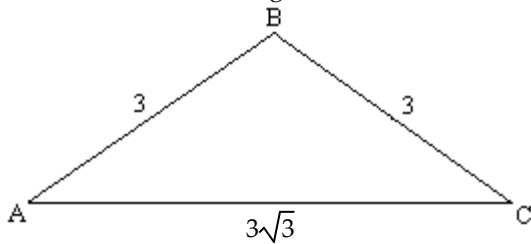
**Solve the problem.**

21) The sum of a student's three scores is 213. If the first is 20 points more than the second, and the sum of the first two is 6 more than twice the third, what was the first score?

22) Find the area of a triangular garden if the sides are approximately 5 feet, 14 feet, and 15 feet.

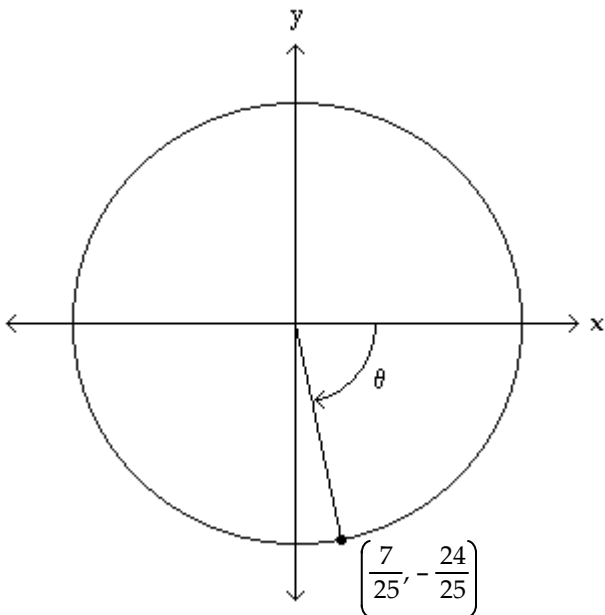
**Find the indicated angle or side.**

23) Find the measure of angle A.



**The figure shows an angle  $\theta$  in standard position with its terminal side intersecting the unit circle. Evaluate the indicated circular function value of  $\theta$ .**

24) Find  $\cot\theta$ .



**Find the center and radius of the circle.**

25)  $x^2 + y^2 + 6x + 4y - 68 = 0$

**Solve the equation or inequality.**

26)  $|8x + 6| + 2 < 10$

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

27)  $|2 - 3x| + 2 \geq 13$

**Solve the problem. Write all linear equations in slope-intercept form.**

28) In a lab experiment 6 grams of acid were produced in 15 minutes and 9 grams in 35 minutes. Find a linear equation that models the number of grams produced in  $x$  minutes.

**Solve the problem.**

29) A lumber yard has fixed costs of \$4079.30 per day and variable costs of \$0.31 per board-foot produced. Lumber sells for \$2.21 per board-foot. How many board-feet must be produced and sold daily to break even?

30) Find the equation of a circle with center at  $(-6, 2)$ , passing through the point  $(-3, 6)$ . Write it in center-radius form.

**Write the function in terms of its cofunction. Assume that any angle in which an unknown appears is an acute angle.**

31)  $\cos(52^\circ - \theta)$

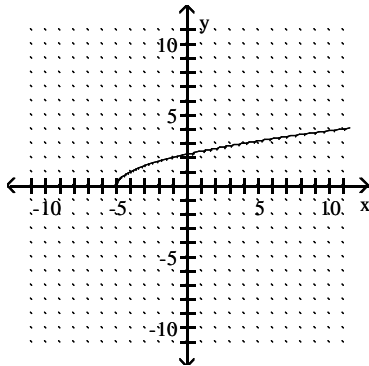
**For the given functions  $f$  and  $g$ , find the indicated composition.**

32)  $f(x) = \frac{3}{x + 6}$ ,  $g(x) = \frac{1}{2x}$

$(f \circ g)(x)$

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

33)



**Answer the question.**

34) For what value of  $c$  does the quadratic function  $f(x) = x^2 - 12x + c$  have exactly one  $x$ -intercept?

**Give all solutions of the nonlinear system of equations, including those with nonreal complex components.**

35)  $x^2 + xy + y^2 = 28$   
 $x + y = 2$

**Find the exact trigonometric function value, without using the calculator.**

36)  $\sec(-1020^\circ)$

**Find the value of the trigonometric function.**

37) Find  $\cot \theta$  if  $\sin \theta = \frac{3}{4}$  and  $\theta$  is in quadrant III.

**Solve the problem. Round your answer to the nearest tenth, when appropriate. Use the formula  $\text{pH} = -\log [\text{H}_3\text{O}^+]$ , as needed.**

38) Find the pH if  $[\text{H}_3\text{O}^+] = 5.9 \times 10^{-4}$ .

**Find all values of  $\theta$ , if  $\theta$  is in the interval  $[0, 360^\circ)$  and has the given function value.**

39)  $\cos \theta = -\frac{\sqrt{3}}{2}$

**Solve the problem.**

40) A boat is 72 feet from the base of cliff. If the distance from the top of the cliff to the boat is 18 less than twice the height of the cliff to the water. Find the height of the cliff. Round to the nearest tenth of a foot if necessary.

**Use the appropriate identity to find the indicated function value.**

41)  $\tan \theta$ , if  $\cot \theta = -\frac{7}{8}$

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

42)  $\frac{x+3}{x-5} < 1$

**Find the function value. If the result is irrational, round your answer to the nearest thousandth.**

43) Let  $f(x) = \left(\frac{1}{3}\right)^x$ . Find  $f(2)$ .

**Find the angle of smallest possible positive measure coterminal with the given angle.**

44)  $1388^\circ$

**Suppose ABC is a right triangle with sides of lengths a, b, and c and right angle at C. Find the unknown side length using the Pythagorean theorem and then find the value of the indicated trigonometric function of the given angle. Rationalize the denominator if applicable.**

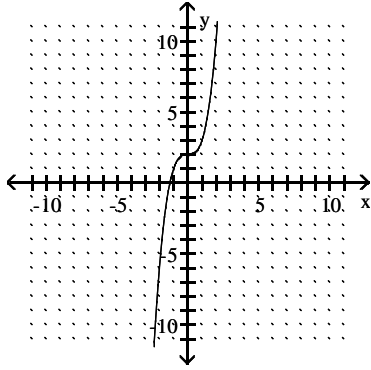
45) Find  $\csc B$  when  $a = 3$  and  $b = 7$ .

**Identify the quadrant for the angle  $\theta$  satisfying the following conditions.**

46)  $\sin \theta > 0$  and  $\cos \theta < 0$

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

47)



If  $f$  is one-to-one, find an equation for its inverse.

48)  $f(x) = -4x + 1$

49)  $f(x) = 5x^2 - 10x + 6$

a. Does the function have a minimum or maximum value? What is it?

b. Find the domain and range of the function.

Write an equivalent expression in exponential form.

50)  $\log_{81} 3 = \frac{1}{4}$

Solve the system.

51)  $4x + 3y + z = -25$

$4x - 5y - z = -3$

$2x + y + 4z = -22$

Convert the angle to radians. Leave as a multiple of  $\pi$ .

52)  $610^\circ$

Identify the vertex of the parabola.

53)  $y = 4x^2 + 8x + 7$

Find the missing parts of the triangle.

54)  $A = 30.0^\circ$

$a = 17.57$

$b = 35.14$

Write in logarithmic form.

55)  $2^{-3} = \frac{1}{8}$

Give all solutions of the nonlinear system of equations, including those with nonreal complex components.

56)  $xy = 56$

$x + y = -15$

**Solve the problem.**

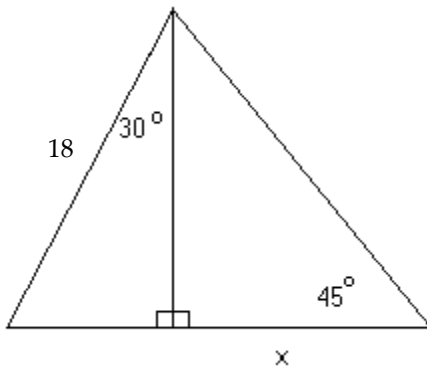
57) Find two consecutive even integers whose product is 168.

**Solve the problem. Round your answer to the nearest tenth, when appropriate. Use the formula  $\text{pH} = -\log [\text{H}_3\text{O}^+]$ , as needed.**

58) Find  $[\text{H}_3\text{O}^+]$  if the  $\text{pH} = 1.4$ .

**Solve the problem.**

59) Find the exact value of  $x$  in the figure.



**Find the domain and range of the given function.**

60)  $f(x) = \cos x$

**Find the area of the sector of a circle. Use the value 3.14 for  $\pi$ .**

61) Radius = 11.92 cm;  $\theta = 137^\circ$

**Find the exact circular function value.**

62)  $\tan \frac{-5\pi}{6}$

**Solve the problem.**

63) Linda invests \$25,000 for one year. Part is invested at 5%, another part at 6%, and the rest at 8%. The total income from all 3 investments is \$1600. The combined income from the 5% and 6% investments is the same as the income from the 8% investment. Find the amount invested at each rate.

**Find the exact value of  $s$  in the given interval that has the given circular function value.**

64)  $\left[ \pi, \frac{3\pi}{2} \right]; \tan s = 1$

**Solve the problem.**

65) On a recent trip, Sarah's car traveled 20 mph faster on the first 180 miles than it did on the remaining 80 miles. The total time for the trip was 4 hr. Find the speed of Sarah's car on the first part of the trip.

**Find the length of an arc intercepted by a central angle  $\theta$  in a circle of radius  $r$ . Round your answer to 1 decimal place.**

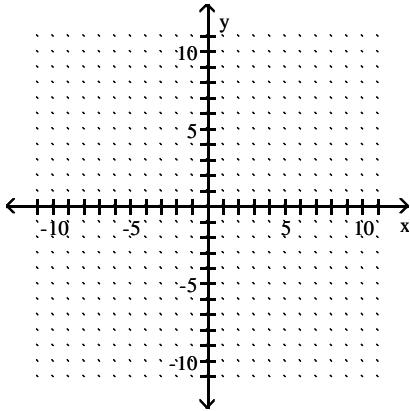
66)  $r = 61.26$  in.;  $\theta = 77^\circ$

**Solve the problem.**

67) Twice the water flow in the hot-water pipe is the same as three times the flow in the cold-water pipe. The combined flow is 1500 L/hr. What is the flow in each pipe?

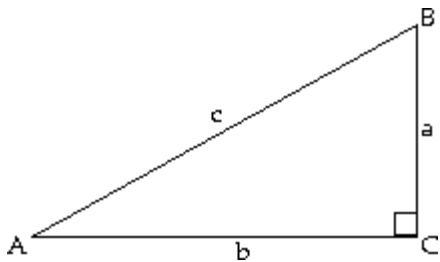
**Graph the function.**

68)  $f(x) = (x - 3)^3 + 4$



**Solve the right triangle. If two sides are given, give angles in degrees and minutes.**

69)



$A = 13^\circ 20'$ ,  $c = 293$  ft

Round side lengths to two decimal places.

**Find the exact value of  $s$  in the given interval that has the given circular function value.**

70)  $\left[\frac{3\pi}{2}, 2\pi\right]; \cos s = \frac{1}{2}$

**Find the missing parts of the triangle.**

71)  $C = 108.5^\circ$

$a = 5.60$  km

$b = 10.80$  km

**Find the domain and range of the function.**

72)  $f(x) = 10 - x^2$

Given  $\log_{10} 2 = 0.3010$  and  $\log_{10} 3 = 0.4771$ , find the logarithm without using a calculator.

73)  $\log_{10} (18^{1/3})$



**Solve the problem.**

74) The outside of a picture frame has a length which is 3 cm more than width. The area enclosed by the outside of the picture frame is 154 square cm. Find the width of the outside of the picture frame.

**Decide whether or not the equation has a circle as its graph. If it does not, describe the graph.**

75)  $x^2 + y^2 - 2x - 14y + 50 = 0$

**Find the exact circular function value.**

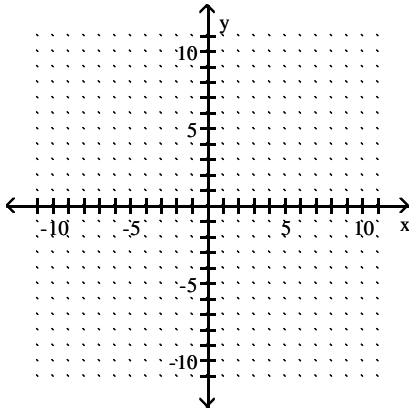
76)  $\sin \frac{-11\pi}{6}$

**Find the coordinates of the other endpoint of the segment, given its midpoint and one endpoint.**

77) midpoint  $(-6, -2)$ , endpoint  $(-3, -1)$

**Graph the function.**

78)  $y = \frac{1}{4}(x + 3)^3 + 1$

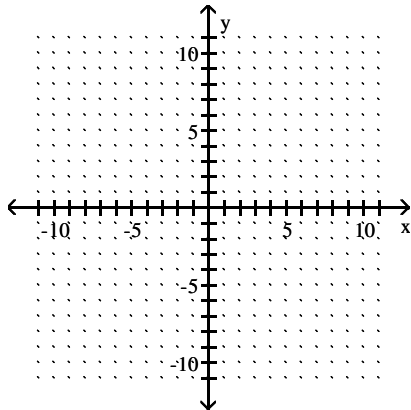


**Perform the calculation.**

79)  $180^\circ - 17^\circ 55' 27''$

**Graph the function.**

80)  $f(x) = -(x - 6)^2 + 4$



**Solve the problem.**

- 81) Radio direction finders are set up at points A and B, 8.68 mi apart on an east-west line. From A it is found that the bearing of a signal from a transmitter is N 54.3°E, while from B it is N 35.7°W. Find the distance of the transmitter from B, to the nearest hundredth of a mile.

**Find the length of an arc intercepted by a central angle  $\theta$  in a circle of radius  $r$ . Round your answer to 1 decimal place.**

- 82)  $r = 45.39$  in.;  $\theta = 13^\circ$

**Solve the equation.**

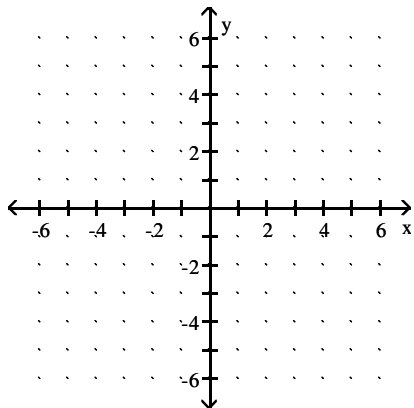
- 83)  $56x^{-2} + 15x^{-1} = 56$

**Use the product, quotient, and power rules of logarithms to rewrite the expression as a single logarithm. Assume that all variables represent positive real numbers.**

- 84)  $\frac{1}{2} \log_2(x^4) + \frac{1}{4} \log_2(x^4) - \frac{1}{6} \log_2 x$

**Graph the function.**

- 85)  $f(x) = 5^x$



**Solve the problem.**

- 86) A rock falls from a tower that is 122.5 m high. As it is falling, its height is given by the formula  $h = 122.5 - 4.9t^2$ , with  $t$  in seconds. How many seconds will it take for the rock to hit the ground ( $h = 0$ )?

**Use the fundamental identities to find the value of the trigonometric function.**

- 87) Find  $\cos \theta$  if  $\sin \theta = -\frac{12}{13}$  and  $\theta$  is in quadrant III.

**Write an equation for the line described. Write the equation in the form specified.**

- 88) perpendicular to  $-8x + y = 4$ , through  $(5, 3)$ ; slope-intercept form

**Determine whether the three points are the vertices of a right triangle.**

- 89)  $(-4, 6)$ ,  $(2, 8)$ ,  $(6, -4)$

**Use the discriminant to determine the number of distinct solutions and whether they are rational, irrational, or nonreal complex.**

- 90)  $w^2 + 2w + 4 = 0$

**Solve the problem.**

- 91) The sum of the squares of the digits of a positive two-digit number is 61, and the tens digit is 1 more than the units digit. Find the number.

**Write the expression as a sum, difference, or product of logarithms. Assume that all variables represent positive real numbers.**

$$92) \log_b \sqrt{\frac{4x^4}{z^3}}$$

**Write the number in standard form  $a + bi$ .**

$$93) \frac{4 + \sqrt{-48}}{2}$$

**Solve the equation.**

$$94) x = 7^{\log_7 6}$$

**Solve the problem.**

- 95) The sum of the squares of two consecutive positive even integers is 1684. Find the integers.

**Solve the equation by completing the square.**

$$96) 3x^2 - 4x - 7 = 0$$

**Solve the equation for the indicated variable.**

$$97) rm = t^2 - mt, \text{ for } t$$

**Solve the equation.**

$$98) \left(\frac{1}{3}\right)^{4x+2} = 9^{x-5}$$

**GOOD LUCK!!!**

Answer Key

Testname: CUMULATIVE REVIEW MA125 FALL 2013

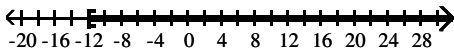
1) C

2)  $\frac{39}{37} - \frac{12}{37}i$

3) {6, 10}

4) {5, 8}

5)  $[-12, \infty)$



6)  $\left\{-\frac{11}{14}\right\}$

7)  $\left[-3, \frac{13}{3}\right]$

8) -35

9) Minimum value: 4

Domain:  $(-\infty, \infty)$ ; Range:  $[4, \infty)$

10) 8779

11) No

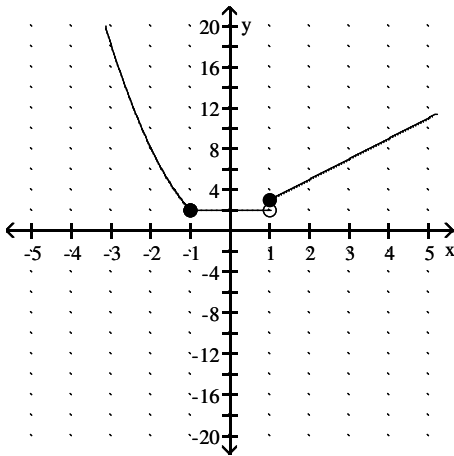
12)  $142^\circ 20' 59''$

13)  $\{-5\sqrt{5}, -4, 4, 5\sqrt{5}\}$

14) Yes

15) No

16)



17)  $\frac{9}{(9-x-h)(9-x)}$

18) Even

19) i

20)  $\omega = \frac{\pi}{24}$  radian per sec

21) 82

22)  $35 \text{ ft}^2$

23)  $30^\circ$

24)  $-\frac{7}{24}$

25) center:  $(-3, -2)$ ; radius: 9

# Answer Key

Testname: CUMULATIVE REVIEW MA125 FALL 2013

26)  $\left(-\frac{7}{4}, \frac{1}{4}\right)$

27)  $(-\infty, -3] \cup \left[\frac{13}{3}, \infty\right)$

28)  $y = \frac{3}{20}x + \frac{15}{4}$

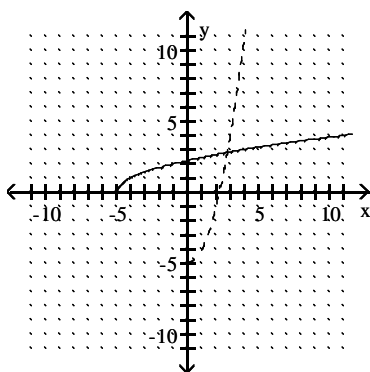
29) 2147 board-feet

30)  $(x + 6)^2 + (y - 2)^2 = 25$

31)  $\sin(\theta + 38^\circ)$

32)  $\frac{6x}{1 + 12x}$

33)



34) 36

35)  $\{(6, -4), (-4, 6)\}$

36) 2

37)  $-\frac{\sqrt{7}}{3}$

38) 3.2

39)  $150^\circ$  and  $210^\circ$

40) 54 ft

41)  $-\frac{8}{7}$

42)  $(-\infty, 5)$

43)  $\frac{1}{9}$

44)  $308^\circ$

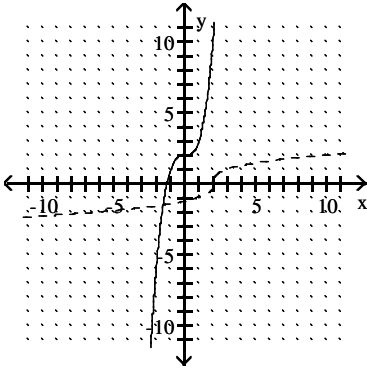
45)  $\frac{\sqrt{58}}{7}$

46) Quadrant II

Answer Key

Testname: CUMULATIVE REVIEW MA125 FALL 2013

47)



48)  $f^{-1}(x) = -\frac{1}{4}x + \frac{1}{4}$

49) minimum value, 1, Domain:  $(-\infty, \infty)$ ; Range:  $[1, \infty)$

50)  $81^{1/4} = 3$

51)  $\{(-4, -2, -3)\}$

52)  $\frac{61\pi}{18}$

53)  $(-1, 3)$

54)  $B = 90.0^\circ, C = 60.0^\circ, c = 30.43$

55)  $\log_2 \frac{1}{8} = -3$

56)  $\{(-7, -8), (-8, -7)\}$

57) 12, 14 or -12, -14

58)  $4.0 \times 10^{-2}$

59)  $9\sqrt{3}$

60) Domain : all real numbers; range:  $[-1, 1]$

61)  $169.94 \text{ cm}^2$

62)  $\frac{\sqrt{3}}{3}$

63) \$10,000 at 5%; \$5000 at 6%; \$10,000 at 8%

64)  $s = \frac{5\pi}{4}$

65) 73 mph

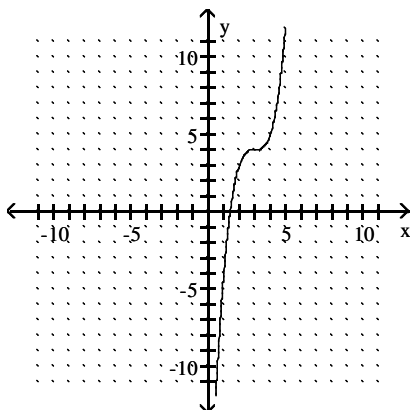
66) 82.3 in.

67) 900 L/hr hot; 600 L/hr cold

Answer Key

Testname: CUMULATIVE REVIEW MA125 FALL 2013

68)



69)  $B = 76^\circ 40'$ ;  $a = 67.57$  ft;  $b = 285.10$  ft

70)  $s = \frac{5\pi}{3}$

71)  $c = 13.7$  km,  $A = 22.8^\circ$ ,  $B = 48.7^\circ$

72) Domain:  $(-\infty, \infty)$ ; Range:  $(-\infty, 10]$

73) 0.4184

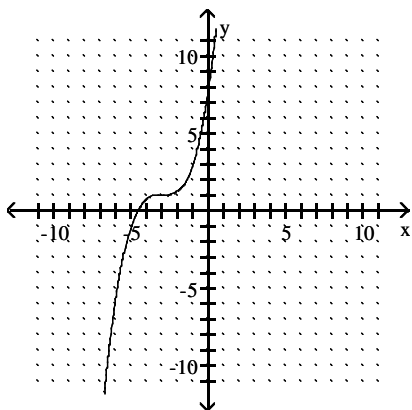
74) 11 cm

75) no; the graph is the point (1, 7)

76)  $\frac{1}{2}$

77)  $(-9, -3)$

78)

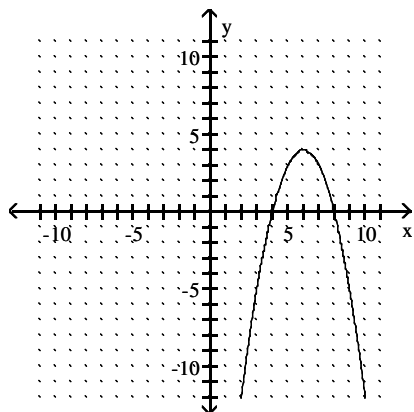


79)  $162^\circ 4' 33''$

Answer Key

Testname: CUMULATIVE REVIEW MA125 FALL 2013

80)



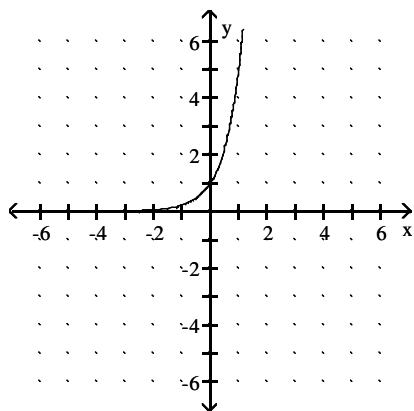
81) 5.07 mi

82) 10.3 in.

83)  $\left\{\frac{8}{7}, -\frac{7}{8}\right\}$

84)  $\log_2(x^{17/6})$

85)



86) 5 sec

87)  $-\frac{5}{13}$

88)  $y = -\frac{1}{8}x + \frac{29}{8}$

89) Yes

90) Two distinct nonreal complex solutions

91) 65

92)  $\log_b 2 + 2\log_b x - \frac{3}{2}\log_b z$

93)  $2 + 2i\sqrt{3}$

94)  $\{6\}$

95) 28, 30

96)  $\left\{\frac{7}{3}, -1\right\}$



Answer Key

Testname: CUMULATIVE REVIEW MA125 FALL 2013

$$97) t = \frac{m \pm \sqrt{m^2 + 4rm}}{2}$$

$$98) \left\{ \frac{4}{3} \right\}$$