

Name \_\_\_\_\_

**Find the logarithm.**

1)  $\log_3(9)$

1) \_\_\_\_\_

2)  $\log_4(16)$

2) \_\_\_\_\_

3)  $\log(10,000)$

3) \_\_\_\_\_

4)  $\log(10)$

4) \_\_\_\_\_

5)  $\log_9(1)$

5) \_\_\_\_\_

6)  $\log_{12}(1)$

6) \_\_\_\_\_

7)  $\log_5(\sqrt{5})$

7) \_\_\_\_\_

8)  $\log_3(\sqrt{3})$

8) \_\_\_\_\_

9)  $\log_{12}(12)$

9) \_\_\_\_\_

10)  $\log_{11}(11)$

10) \_\_\_\_\_

11)  $\log_2\left(\frac{1}{8}\right)$

11) \_\_\_\_\_

12)  $\log_2\left(\frac{1}{4}\right)$

12) \_\_\_\_\_

13)  $\log_{125}(5)$

13) \_\_\_\_\_

14)  $\log_{16}(4)$

14) \_\_\_\_\_

15)  $\log_2(\log_2(16))$

15) \_\_\_\_\_

16)  $\log_b(\sqrt{b})$

16) \_\_\_\_\_

17)  $\log_b(\sqrt{b})$

17) \_\_\_\_\_

18)  $\log_b(b)$

18) \_\_\_\_\_

19)  $\log_b(1)$

19) \_\_\_\_\_

20)  $\log_b\left(\frac{1}{b^5}\right)$

20) \_\_\_\_\_

21)  $\log_b\left(\frac{1}{b^2}\right)$

21) \_\_\_\_\_

**Find the inverse of the given function.**

22)  $\log_5(x)$

22) \_\_\_\_\_

23)  $\log_5(x)$

23) \_\_\_\_\_

24)  $\log_2(x)$

24) \_\_\_\_\_

25)  $\log_3(x)$

25) \_\_\_\_\_

26)  $4^x$

26) \_\_\_\_\_

27)  $5^x$

27) \_\_\_\_\_

28)  $2^x$

28) \_\_\_\_\_

29)  $3^x$

29) \_\_\_\_\_

**Evaluate.**

30) Let  $g(x) = 4^x$ . Find  $g(4)$

30) \_\_\_\_\_

31) Let  $g(x) = 6^x$ . Find  $g(3)$

31) \_\_\_\_\_

32) Let  $g(x) = 2^x$ . Find  $g(4)$

32) \_\_\_\_\_

33) Let  $g(x) = 2^x$ . Find  $g^{-1}(16)$

33) \_\_\_\_\_

34) Let  $g(x) = 6^x$ . Find  $g^{-1}(36)$

34) \_\_\_\_\_

35) Let  $g(x) = 3^x$ . Find  $g^{-1}(81)$

35) \_\_\_\_\_

36) Let  $f(x) = \log_4(x)$ . Find  $f(16)$

36) \_\_\_\_\_

37) Let  $f(x) = \log_3(x)$ . Find  $f(27)$

37) \_\_\_\_\_

38) Let  $f(x) = \log_4(x)$ . Find  $f(64)$

38) \_\_\_\_\_

39) Let  $f(x) = \log_4(x)$ . Find  $f^{-1}(3)$

39) \_\_\_\_\_

40) Let  $f(x) = \log_3(x)$ . Find  $f^{-1}(2)$

40) \_\_\_\_\_

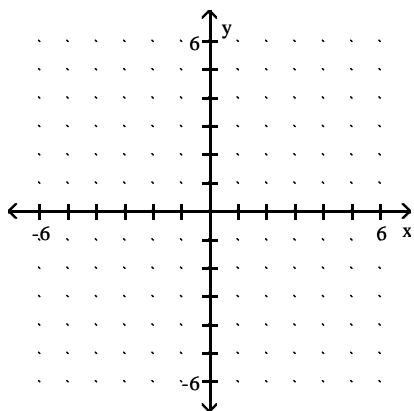
41) Let  $f(x) = \log_5(x)$ . Find  $f^{-1}(2)$

41) \_\_\_\_\_

**Sketch the graph of the function.**

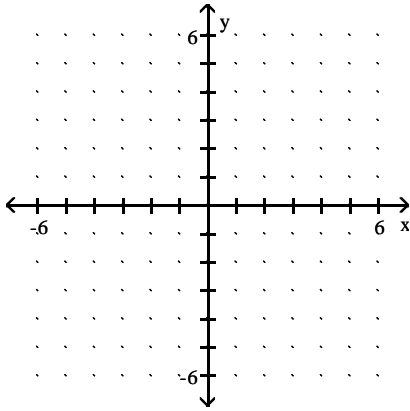
42)  $y = \log_2(x)$

42) \_\_\_\_\_



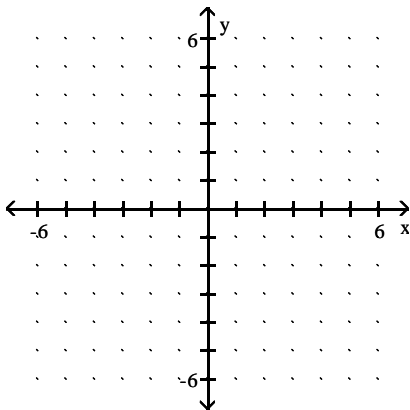
43)  $y = \log_4(x)$

43) \_\_\_\_\_



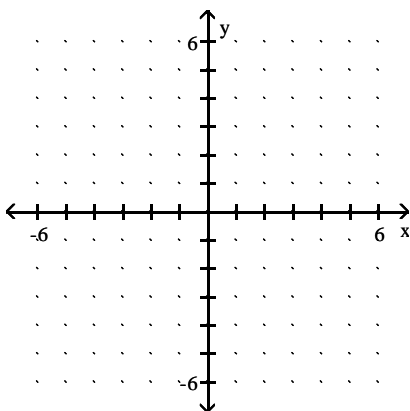
44)  $y = \log_5(x)$

44) \_\_\_\_\_



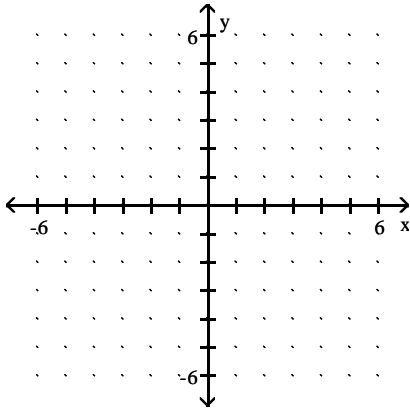
45)  $y = \log_{1/3}(x)$

45) \_\_\_\_\_



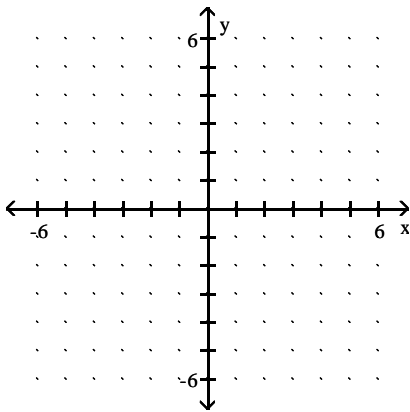
46)  $y = \log_{1/4}(x)$

46) \_\_\_\_\_



47)  $y = \log_{1/2}(x)$

47) \_\_\_\_\_



**Simplify. Write the expression as a single logarithm with a coefficient of 1.**

48)  $8 \ln(a) - 2 \ln(b)$

48) \_\_\_\_\_

49)  $6 \ln(a) - 8 \ln(b)$

49) \_\_\_\_\_

50)  $9 \ln(a) - 2 \ln(b)$

50) \_\_\_\_\_

51)  $12 \ln(x - 7) - 11 \ln(x)$

51) \_\_\_\_\_

52)  $4 \ln(x - 5) - 3 \ln(x)$

52) \_\_\_\_\_

53)  $7 \ln(x - 2) - 3 \ln(x)$

53) \_\_\_\_\_

54)  $2 \ln(x^2) + 4 \ln(3x)$

54) \_\_\_\_\_

55)  $4 \ln(x^2) + 3 \ln(3x)$

55) \_\_\_\_\_

56)  $4 \ln(x^2) + 4 \ln(4x)$

56) \_\_\_\_\_

57)  $2 \ln(w^2) - \ln(3w^9)$

57) \_\_\_\_\_

58)  $2 \ln(w^2) - \ln(4w^8)$

58) \_\_\_\_\_

59)  $3 \ln(w^2) - \ln(2w^8)$

59) \_\_\_\_\_



Solve the equation. Round the solution to four decimal places, if necessary.

60)  $e^{2x} = 7$

60) \_\_\_\_\_

61)  $e^{3x} = 8$

61) \_\_\_\_\_

62)  $e^{(x+8)} = 5$

62) \_\_\_\_\_

63)  $e^{(x+4)} = 8$

63) \_\_\_\_\_

64)  $\ln(9x) + \ln(5x) = 7$

64) \_\_\_\_\_

65)  $\ln(4x) + \ln(5x) = 8$

65) \_\_\_\_\_

66)  $-3 \ln(4x^3) + 4 \ln(8x^4) = 5$

66) \_\_\_\_\_

67)  $3 \ln(6x^2) - 3 \ln(5x^5) = 3$

67) \_\_\_\_\_

68)  $e^{2x-9} \cdot e^{5x} = 112$

68) \_\_\_\_\_

69)  $e^{5x} - 8 \cdot e^{5x} = 107$

69) \_\_\_\_\_

70)  $e^{4x} - 2 \cdot e^{3x} = 130$

70) \_\_\_\_\_

71)  $5e^x - 17 = 3e^x + 62$

71) \_\_\_\_\_

72)  $5e^x - 28 = 2e^x + 49$

72) \_\_\_\_\_

73)  $\ln(6x^7) - 2 \ln(x^3) = 9$

73) \_\_\_\_\_

74)  $\ln(7x^7) - 2 \ln(x^3) = 2$

74) \_\_\_\_\_

**Solve the problem.**75) The loudness of sound can be measured on a decibel scale. The sound level  $L$  (in decibels)

75) \_\_\_\_\_

of a sound is given by  $L = 10 \log\left(\frac{I}{I_0}\right)$ , where  $I$  is the intensity of the sound (in watts persquare meter,  $W/m^2$ ) and  $I_0 = 10^{-12} W/m^2$ . A certain sound has intensity of $2.65 \times 10^{-5} W/m^2$ . Find the decibel value of this sound? (Round to the nearest whole number.)

76) The loudness of sound can be measured on a decibel scale. The sound level  $L$  (in decibels) of a sound is given by  $L = 10\log\left(\frac{I}{I_0}\right)$ , where  $I$  is the intensity of the sound (in watts per square meter,  $W/m^2$ ) and  $I_0 = 10^{-12} W/m^2$ . A certain sound has intensity of  $4.79 \times 10^{-5} W/m^2$ . Find the decibel value of this sound? (Round to the nearest whole number.) 76) \_\_\_\_\_

77) The pH of a solution ranges from 0 to 14. An acid has a pH less than 7. Pure water is neutral and has a pH of 7. The pH of a solution is given by  $pH = -\log(H^+)$  where  $H^+$  represents the concentration of the hydrogen ions in the solution in moles per liter. Find the pH if the hydrogen ion concentration is  $1 \times 10^{-6}$ . 77) \_\_\_\_\_

78) The pH of a solution ranges from 0 to 14. An acid has a pH less than 7. Pure water is neutral and has a pH of 7. The pH of a solution is given by  $pH = -\log(H^+)$  where  $H^+$  represents the concentration of the hydrogen ions in the solution in moles per liter. Find the pH if the hydrogen ion concentration is  $1 \times 10^{-2}$ . 78) \_\_\_\_\_

79) The pH of a solution ranges from 0 to 14. An acid has a pH less than 7. Pure water is neutral and has a pH of 7. The pH of a solution is given by  $pH = -\log(H^+)$  where  $H^+$  represents the concentration of the hydrogen ions in the solution in moles per liter. Find the pH if the hydrogen ion concentration is  $5.6 \times 10^{-14}$ . 79) \_\_\_\_\_

80) The pH of a solution ranges from 0 to 14. An acid has a pH less than 7. Pure water is neutral and has a pH of 7. The pH of a solution is given by  $pH = -\log(H^+)$  where  $H^+$  represents the concentration of the hydrogen ions in the solution in moles per liter. Find the pH if the hydrogen ion concentration is  $7 \times 10^{-2}$ . 80) \_\_\_\_\_

**Solve.**

81)  $\log_4(x) = 3$  81) \_\_\_\_\_

$$82) \log_6(x) = 1$$

82) \_\_\_\_\_

$$83) \log(x) = 4$$

83) \_\_\_\_\_

$$84) \log_2(x) = -3$$

84) \_\_\_\_\_

$$85) \log_6(x + 4) = 2$$

85) \_\_\_\_\_

$$86) \log_2(x + 2) = -1$$

86) \_\_\_\_\_

$$87) \log_4(x + 1) = -1$$

87) \_\_\_\_\_

$$88) \log_2(12 - 2x) = 3$$

88) \_\_\_\_\_

$$89) \log(5x - 8) = 1$$

89) \_\_\_\_\_

$$90) 4\log_{16}(x) + 4 = 5$$

90) \_\_\_\_\_

$$91) \log_3(\log_3(y)) = 1$$

91) \_\_\_\_\_

$$92) \log_{10}(x^2) = 4$$

92) \_\_\_\_\_

$$93) \log_x(4) = 2$$

93) \_\_\_\_\_

$$94) \log_x(64) = 3$$

94) \_\_\_\_\_

$$95) \log_x(9) = 2$$

95) \_\_\_\_\_

**Solve. Round any approximate solution to the fourth decimal place.**

$$96) 5^x = 625$$

96) \_\_\_\_\_

$$97) 3^{2x+1} = 243$$

97) \_\_\_\_\_

$$98) 4^{3x-1} = 16$$

98) \_\_\_\_\_

$$99) 2^x + 6 = 3$$

99) \_\_\_\_\_

$$100) 2^x + 6 = 3$$

100) \_\_\_\_\_

101)  $8^{6x} = 4.1$

101) \_\_\_\_\_

102)  $4^x + 7 = 3$

102) \_\_\_\_\_

103)  $5(4)^x = 30$

103) \_\_\_\_\_

**Solve the equation. Round the solution to four decimal places, if necessary.**

104)  $6^x - 4 = 50 - 3(6^x)$

104) \_\_\_\_\_

105)  $2^x + 5 = 58 - 9(2^x)$

105) \_\_\_\_\_

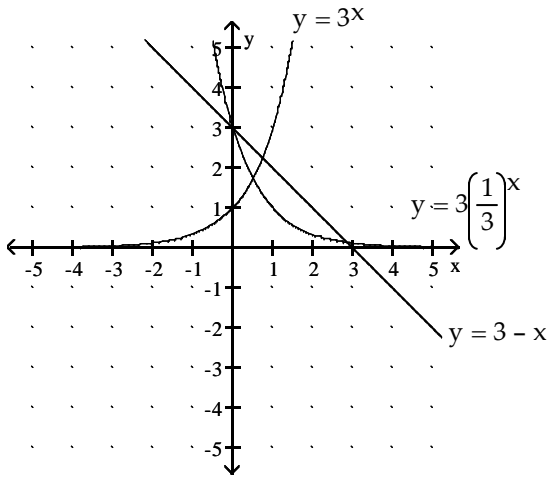
106)  $3^{7x} \cdot 3^{8x} - 1 = 82$

106) \_\_\_\_\_

107)  $6^{9x} \cdot 6^{6x} + 9 = 80$

107) \_\_\_\_\_

Estimate any solutions of the equation or system by referring to the graphs shown.



108)  $3^x = 3 - x$

108) \_\_\_\_\_

109)  $3\left(\frac{1}{3}\right)^x = 3 - x$

109) \_\_\_\_\_

110)  $3^x = 4$

110) \_\_\_\_\_

**Solve the problem.**

111) The function  $y = 500e^{-0.00866x}$  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 500 pounds of the material are initially put into the vault, how many pounds will be left after 100 years?

111) \_\_\_\_\_

112) The value of a particular investment follows a pattern of exponential growth. In the year 2000, you invested money in a money market account. The value of your investment  $t$  years after 2000 is given by the exponential growth model  $f(t) = 1300e^{0.058t}$ . How much did you initially invest in the account?

112) \_\_\_\_\_

113) The value of a particular investment follows a pattern of exponential growth. In the year 2000, you invested money in a money market account. The value of your investment  $t$  years after 2000 is given by the exponential growth model  $f(t) = 7300e^{0.067t}$ . When will the account be worth \$8925? 113) \_\_\_\_\_

114) The function  $y = 200e^{-0.01386x}$  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 200 pounds of the material are placed in the vault, how much time will need to pass for only 132 pounds to remain? 114) \_\_\_\_\_

115) Solve  $ab^{cx+d} + k = h$  for  $x$ . Assume that  $b > 0$ ,  $b \neq 1$ , and that the constants have values for which the equation has exactly one real number solution. 115) \_\_\_\_\_

116) Solve  $ab^{cx-d} = k$  for  $x$ . Assume that  $b > 0$ ,  $b \neq 1$ , and that the constants have values for which the equation has exactly one real number solution. 116) \_\_\_\_\_

**Find the horizontal asymptote(s), if any, of the graph of the rational function.**

117)  $g(x) = \frac{x^2 + 9x - 4}{x - 4}$  117) \_\_\_\_\_

118)  $g(x) = \frac{x^2 + 3x - 9}{x - 9}$  118) \_\_\_\_\_



$$119) f(x) = \frac{-5x - 4}{3x + 5}$$

119) \_\_\_\_\_

$$120) h(x) = \frac{-3x + 5}{4x + 1}$$

120) \_\_\_\_\_

$$121) g(x) = \frac{8x^2 - 5x - 2}{6x^2 - 7x + 3}$$

121) \_\_\_\_\_

$$122) g(x) = \frac{8x^2 - 3x - 3}{4x^2 - 5x + 6}$$

122) \_\_\_\_\_

**Find the domain of the function.**

$$123) f(x) = \frac{1}{x - 7} + \frac{4}{x + 2}$$

123) \_\_\_\_\_

$$124) f(x) = \frac{1}{x - 6} + \frac{4}{x - 1}$$

124) \_\_\_\_\_

$$125) f(x) = \frac{1}{x - 5} + \frac{4}{x + 7}$$

125) \_\_\_\_\_

**Rationalize the denominator.**

$$126) \frac{\sqrt{2}}{\sqrt{17} + 2}$$

126) \_\_\_\_\_

$$127) \frac{\sqrt{3}}{\sqrt{17} + 2}$$

127) \_\_\_\_\_

$$128) \frac{3}{\sqrt{7} + \sqrt{10}}$$

128) \_\_\_\_\_

$$129) \frac{3}{\sqrt{2} + \sqrt{5}}$$

129) \_\_\_\_\_

$$130) \frac{4}{\sqrt{10} + \sqrt{14}}$$

130) \_\_\_\_\_

$$131) \frac{7}{\sqrt{6} + \sqrt{13}}$$

131) \_\_\_\_\_

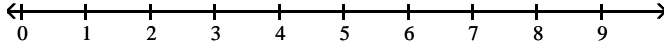
$$132) \frac{10}{\sqrt{5} + \sqrt{15}}$$

132) \_\_\_\_\_

Solve the absolute value inequality. Other than  $\emptyset$ , use interval notation to express the solution set and graph the solution set on a number line.

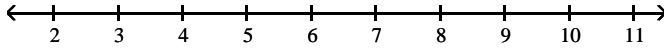
133)  $|7x - 5| - 3 < -7$

133) \_\_\_\_\_



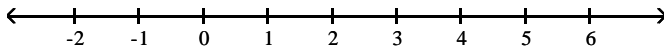
134)  $|3x - 9| + 5 < 1$

134) \_\_\_\_\_



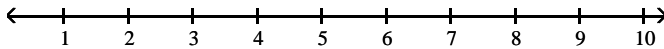
135)  $|3x + 5| + 1 < -2$

135) \_\_\_\_\_



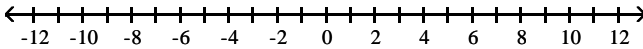
136)  $|2x - 8| + 8 < 1$

136) \_\_\_\_\_



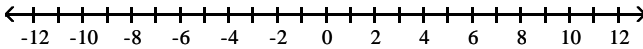
137)  $|x + 7| \geq 0$

137) \_\_\_\_\_



138)  $|x - 2| \geq 0$

138) \_\_\_\_\_



## Answer Key

Testname: E4 PREP CH 4 & OTHERS V02

1) 2

2) 2

3) 4

4) 1

5) 0

6) 0

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

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

9) 1

10) 1

11) -3

12) -2

13)  $\frac{1}{3}$

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

15) 2

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

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

18) 1

19) 0

20) -5

21) -2

22)  $5^x$

23)  $5^x$

24)  $2^x$

25)  $3^x$

26)  $\log_4(x)$

27)  $\log_5(x)$

28)  $\log_2(x)$

29)  $\log_3(x)$

30) 256

31) 216

32) 16

33) 4

34) 2

35) 4

36) 2

37) 3

38) 3

39) 64

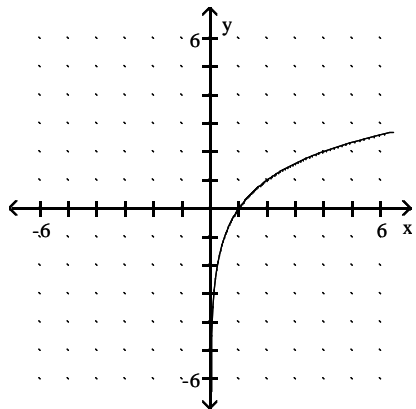
Answer Key

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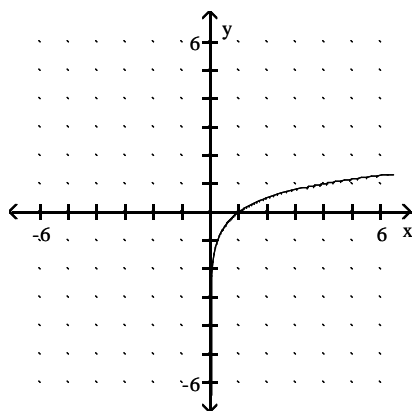
40) 9

41) 25

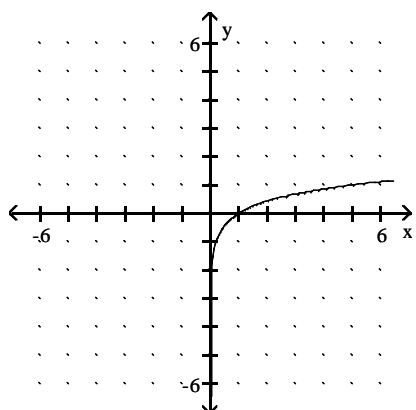
42)



43)



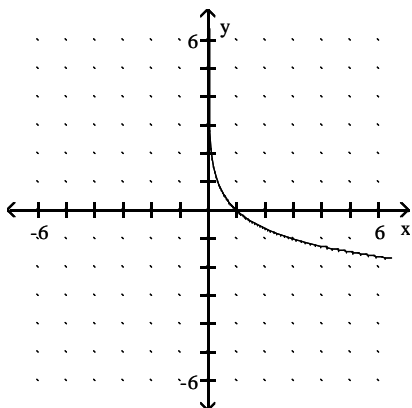
44)



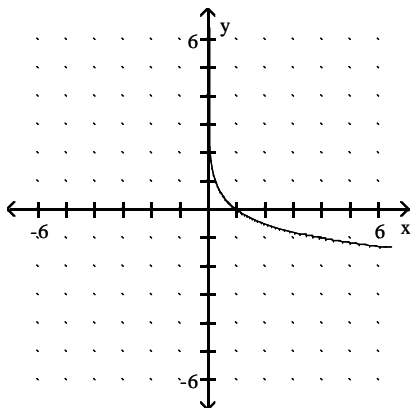
Answer Key

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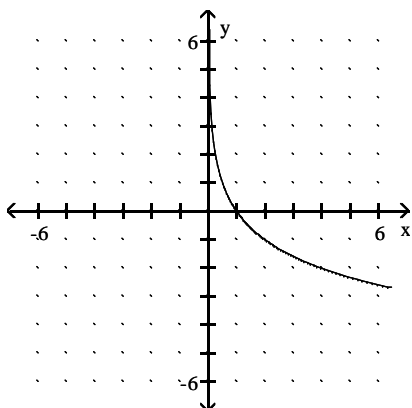
45)



46)



47)



48)  $\ln \left\{ \frac{a^8}{b^2} \right\}$

49)  $\ln \left\{ \frac{a^6}{b^8} \right\}$

50)  $\ln \left\{ \frac{a^9}{b^2} \right\}$

51)  $\ln \left\{ \frac{(x-7)^{12}}{x^{11}} \right\}$

## Answer Key

Testname: E4 PREP CH 4 & OTHERS V02

$$52) \ln \left( \frac{(x-5)^4}{x^3} \right)$$

$$53) \ln \left( \frac{(x-2)^7}{x^3} \right)$$

$$54) \ln (81x^8)$$

$$55) \ln (27x^{11})$$

$$56) \ln (256x^{12})$$

$$57) \ln \left( \frac{1}{3w^5} \right)$$

$$58) \ln \left( \frac{1}{4w^4} \right)$$

$$59) \ln \left( \frac{1}{2w^2} \right)$$

$$60) 0.9730$$

$$61) 0.6931$$

$$62) -6.3906$$

$$63) -1.9206$$

$$64) 4.9366$$

$$65) 12.2085$$

$$66) 1.1277$$

$$67) 0.7614$$

$$68) 1.9598$$

$$69) 1.2673$$

$$70) 0.9811$$

$$71) 3.6763$$

$$72) 3.2452$$

$$73) 1350.514$$

$$74) 1.0556$$

$$75) 74 \text{ decibels}$$

$$76) 77 \text{ decibels}$$

$$77) 6$$

$$78) 2$$

$$79) 13.25$$

$$80) 1.15$$

$$81) 64$$

$$82) 6$$

$$83) 10,000$$

$$84) \frac{1}{8}$$

$$85) 32$$

$$86) -\frac{3}{2}$$

$$87) -\frac{3}{4}$$

$$88) 2$$

## Answer Key

Testname: E4 PREP CH 4 & OTHERS V02

89)  $\frac{18}{5}$

90) 2

91) 27

92) 100, -100

93) 2

94) 4

95) 3

96) 4

97) 2

98) 1

99) -4.4150

100) -4.4150

101) 0.1131

102) -6.2075

103) 1.2925

104) 1.4526

105) 2.4060

106) 0.3341

107) -0.4370

108) 0.7

109) 0, 2.9

110) 1.3

111) 210 pounds

112) \$1300.00

113) 2003

114) 30 years

115)  $x = \frac{\log\left(\frac{h-k}{a}\right) - d \log(b)}{c \log(b)}$

116)  $x = \frac{\log\left(\frac{k}{a}\right) + d \log(b)}{c \log(b)}$

117) no horizontal asymptote

118) no horizontal asymptote

119)  $y = -\frac{5}{3}$

120)  $y = -\frac{3}{4}$

121)  $y = \frac{4}{3}$

122)  $y = 2$

123)  $(-\infty, -2) \cup (-2, 7) \cup (7, \infty)$

124)  $(-\infty, 1) \cup (1, 6) \cup (6, \infty)$

125)  $(-\infty, -7) \cup (-7, 5) \cup (5, \infty)$

126)  $\frac{\sqrt{34} - 2\sqrt{2}}{13}$



Answer Key

Testname: E4 PREP CH 4 & OTHERS V02

127)  $\frac{\sqrt{51} - 2\sqrt{3}}{13}$

128)  $\sqrt{10} - \sqrt{7}$

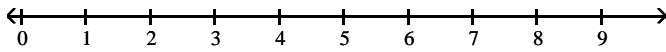
129)  $\sqrt{5} - \sqrt{2}$

130)  $\sqrt{14} - \sqrt{10}$

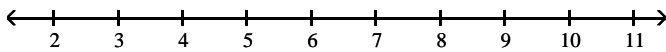
131)  $\sqrt{13} - \sqrt{6}$

132)  $\sqrt{15} - \sqrt{5}$

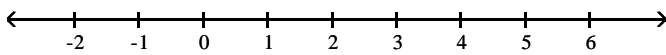
133)  $\emptyset$



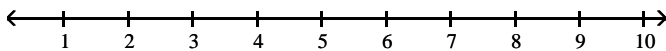
134)  $\emptyset$



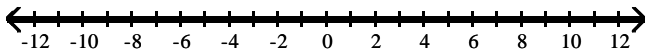
135)  $\emptyset$



136)  $\emptyset$



137)  $(-\infty, \infty)$



138)  $(-\infty, \infty)$

