

Name _____

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

1) $5^{x+7} = 3$

1) _____

Objective: (3.4) Use Logarithms to Solve Exponential Equations

2) $e^{4x} = 7$

2) _____

Objective: (3.4) Use Logarithms to Solve Exponential Equations

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

3) $e^x = 4.2$

3) _____

Objective: (3.4) Use Logarithms to Solve Exponential Equations

4) $3^x = 11$

4) _____

Objective: (3.4) Use Logarithms to Solve Exponential Equations

5) $3e^x = 29$

5) _____

Objective: (3.4) Use Logarithms to Solve Exponential Equations

For the given functions f and g, find the requested composite function value.

6) $f(x) = 2x + 2$, $g(x) = 2x^2 + 1$; Find $(g \circ f)(2)$.

6) _____

Objective: (5.1) Form a Composite Function

7) $f(x) = 2x + 7$, $g(x) = -2/x$; Find $(g \circ f)(3)$.

7) _____

Objective: (5.1) Form a Composite Function

8) $f(t) = \sqrt{t^4 + 30t^2 + 225}$, $g(t) = \frac{t+3}{3}$; Find $(f \circ g)(15)$.

8) _____

Objective: (5.1) Form a Composite Function

For the given functions f and g, find the requested composite function.

9) $f(x) = 7x + 6$, $g(x) = 5x - 1$; Find $(f \circ g)(x)$.

9) _____

Objective: (5.1) Form a Composite Function

10) $f(x) = \frac{3}{x-1}$, $g(x) = \frac{8}{3x}$; Find $(f \circ g)(x)$.

10) _____

Objective: (5.1) Form a Composite Function

Decide whether the composite functions, $f \circ g$ and $g \circ f$, are equal to x.

11) $f(x) = \frac{x+2}{3}$, $g(x) = 3x - 2$

11) _____

Objective: (5.1) Form a Composite Function

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

12) _____

Objective: (5.1) Form a Composite Function

Solve the problem.

- 13) An oil well off the Gulf Coast is leaking, with the leak spreading oil over the surface of the gulf as a circle. At any time t , in minutes, after the beginning of the leak, the radius of the oil slick on the surface is $r(t) = 3t$ ft. Find the area A of the oil slick as a function of time. **13)** _____

Objective: (5.1) Form a Composite Function

- 14) An airline charter service charges a fare per person of \$500 plus \$30 for each unsold seat. The airplane holds 25 passengers. Let x represent the number of unsold seats and write an expression for the total revenue R for a charter flight. **14)** _____

Objective: (5.1) Form a Composite Function

Find the domain of the composite function $f \circ g$.

- 15) $f(x) = \frac{10}{x+10}$; $g(x) = x+6$ **15)** _____

Objective: (5.1) Find the Domain of a Composite Function

- 16) $f(x) = x+6$; $g(x) = \frac{9}{x+2}$ **16)** _____

Objective: (5.1) Find the Domain of a Composite Function

- 17) $f(x) = \frac{1}{x-7}$; $g(x) = \frac{-49}{x}$ **17)** _____

Objective: (5.1) Find the Domain of a Composite Function

- 18) $f(x) = \frac{1}{x-7}$; $g(x) = \sqrt{x-1}$ **18)** _____

Objective: (5.1) Find the Domain of a Composite Function

Indicate whether the function is one-to-one.

19) $\{(-2, -19), (-3, 14), (19, 17)\}$

Objective: (5.2) Determine Whether a Function Is One-to-One

19) _____

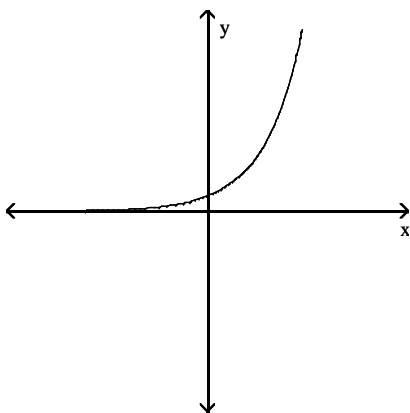
20) $\{(7, 4), (-8, 4), (-20, 7)\}$

Objective: (5.2) Determine Whether a Function Is One-to-One

20) _____

Use the horizontal line test to determine whether the function is one-to-one.

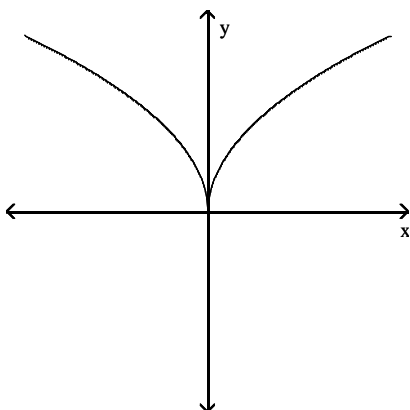
21)



Objective: (5.2) Determine Whether a Function Is One-to-One

21) _____

22)



Objective: (5.2) Determine Whether a Function Is One-to-One

22) _____

Find the inverse of the function and state its domain and range .

23) $\{(8, 1), (-1, -8), (-6, 5), (6, -5)\}$

23) _____

Objective: (5.2) Determine the Inverse of a Function Defined by a Map or a Set of Ordered Pairs

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

24) $f(x) = 3x + 9, g(x) = \frac{1}{3}x - 3$

24) _____

Objective: (5.2) Find the Inverse of a Function Defined by an Equation

25) $f(x) = (x - 6)^2, x \geq 6; g(x) = \sqrt{x} + 6$

25) _____

Objective: (5.2) Find the Inverse of a Function Defined by an Equation

26) $f(x) = (x - 2)^2, x \geq 2; g(x) = \sqrt{x + 2}$

26) _____

Objective: (5.2) Find the Inverse of a Function Defined by an Equation

The function f is one-to-one. Find its inverse.

27) $f(x) = 3x - 6$

27) _____

Objective: (5.2) Find the Inverse of a Function Defined by an Equation

28) $f(x) = 5x^2 - 8, x \geq 0$

28) _____

Objective: (5.2) Find the Inverse of a Function Defined by an Equation

29) $f(x) = \frac{5}{3x + 7}$

29) _____

Objective: (5.2) Find the Inverse of a Function Defined by an Equation

30) $f(x) = \frac{4}{x+4}$

30) _____

Objective: (5.2) Find the Inverse of a Function Defined by an Equation

31) $f(x) = \sqrt[3]{x+7}$

31) _____

Objective: (5.2) Find the Inverse of a Function Defined by an Equation

Find a formula for the inverse of the function described below.

32) A size 56 dress in Country C is size 20 in Country D. A function that converts dress sizes in Country C to those in Country D is $f(x) = \frac{x}{2} - 8$.

32) _____

Objective: (5.2) Find the Inverse of a Function Defined by an Equation

Approximate the value using a calculator. Express answer rounded to three decimal places.

33) $2^{\sqrt{6}}$

33) _____

Objective: (5.3) Evaluate Exponential Functions

34) $e^{-1.4}$

34) _____

Objective: (5.3) Evaluate Exponential Functions

Solve the problem.

35) The function $D(h) = 6e^{-0.4h}$ can be used to determine the milligrams D of a certain drug in a patient's bloodstream h hours after the drug has been given. How many milligrams (to two decimals) will be present after 10 hours?

35) _____

Objective: (5.3) Evaluate Exponential Functions

36) A rumor is spread at an elementary school with 1200 students according to the model $N = 1200(1 - e^{-0.16d})$ where N is the number of students who have heard the rumor and d is the number of days that have elapsed since the rumor began. How many students will have heard the rumor after 5 days?

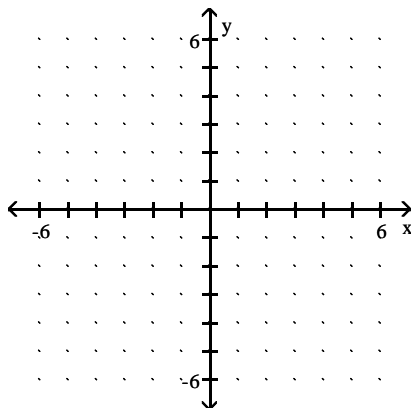
36) _____

Objective: (5.3) Evaluate Exponential Functions

Use transformations to graph the function. Determine the domain, range, and horizontal asymptote of the function.

37) $f(x) = 5(x - 3)$

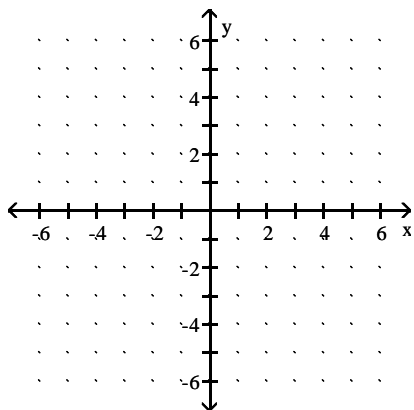
37) _____



Objective: (5.3) Graph Exponential Functions

38) $f(x) = 2^{-x} + 5$

38) _____

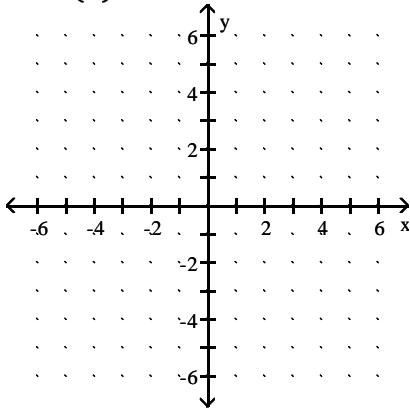


Objective: (5.3) Graph Exponential Functions

Graph the function.

39) $f(x) = \left(\frac{1}{3}\right)^x$

39) _____



Objective: (5.3) Graph Exponential Functions

Solve the equation.

40) $4^{-x} = \frac{1}{16}$

40) _____

Objective: (5.3) Solve Exponential Equations

41) $2(3x - 7) = 4$

41) _____

Objective: (5.3) Solve Exponential Equations

42) $2x^2 - 3 = 64$

42) _____

Objective: (5.3) Solve Exponential Equations

43) $9^{2x} \cdot 27^{(3-x)} = \frac{1}{9}$

43) _____

Objective: (5.3) Solve Exponential Equations

44) $64^x - 4 = 16^{3x}$

44) _____

Objective: (5.3) Solve Exponential Equations

Solve the problem.

45) Suppose that $f(x) = 5^x + 6$. If $f(x) = 1/131$, what is x ?

45) _____

Objective: (5.3) Solve Exponential Equations

Change the exponential expression to an equivalent expression involving a logarithm.

46) $7^3 = 343$

46) _____

Objective: (5.4) Change Exponential Statements to Logarithmic Statements & Logarithmic Statements to Exponential Statements

47) $5^2 = x$

47) _____

Objective: (5.4) Change Exponential Statements to Logarithmic Statements & Logarithmic Statements to Exponential Statements

48) $32^{1/5} = 2$

48) _____

Objective: (5.4) Change Exponential Statements to Logarithmic Statements & Logarithmic Statements to Exponential Statements

Change the logarithmic expression to an equivalent expression involving an exponent.

49) $\log_{1/5} 625 = -4$

49) _____

Objective: (5.4) Change Exponential Statements to Logarithmic Statements & Logarithmic Statements to Exponential Statements

50) $\log_3 9 = 2$

50) _____

Objective: (5.4) Change Exponential Statements to Logarithmic Statements & Logarithmic Statements to Exponential Statements

51) $\log_5 25 = x$

51) _____

Objective: (5.4) Change Exponential Statements to Logarithmic Statements & Logarithmic Statements to Exponential Statements

52) $\ln x = 4$

52) _____

Objective: (5.4) Change Exponential Statements to Logarithmic Statements & Logarithmic Statements to Exponential Statements

53) $\ln \frac{1}{e^5} = -5$

53) _____

Objective: (5.4) Change Exponential Statements to Logarithmic Statements & Logarithmic Statements to Exponential Statements

Find the exact value of the logarithmic expression.

54) $\log_4 \frac{1}{64}$

54) _____

Objective: (5.4) Evaluate Logarithmic Expressions

55) $\log_{1/5} 25$

55) _____

Objective: (5.4) Evaluate Logarithmic Expressions

56) $\log_5 \sqrt{5}$

Objective: (5.4) Evaluate Logarithmic Expressions

56) _____

57) $\ln e^3$

Objective: (5.4) Evaluate Logarithmic Expressions

57) _____

Use a calculator to evaluate the expression. Round your answer to three decimal places

58)

$$\frac{\ln \frac{7}{5}}{0.94}$$

Objective: (5.4) Evaluate Logarithmic Expressions

58) _____

59) $\frac{\log 7 + \log 2}{\ln 2 - \ln 5}$

Objective: (5.4) Evaluate Logarithmic Expressions

59) _____

Solve the problem.

60) The pH of a chemical solution is given by the formula

$$\text{pH} = -\log_{10}[\text{H}^+]$$

where $[\text{H}^+]$ is the concentration of hydrogen ions in moles per liter.

Find the pH if the $[\text{H}^+] = 8.4 \times 10^{-13}$.

Objective: (5.4) Evaluate Logarithmic Expressions

60) _____

Solve the equation.

61) $\log_5 x^2 = 4$

Objective: (5.4) Solve Logarithmic Equations

61) _____

62) $\log_3(x^2 - 2x) = 1$

Objective: (5.4) Solve Logarithmic Equations

62) _____

63) $7 + 9 \ln x = 4$

Objective: (5.4) Solve Logarithmic Equations

63) _____

64) $\ln \sqrt{x + 5} = 3$

Objective: (5.4) Solve Logarithmic Equations

64) _____

The Richter scale converts seismographic readings into numbers for measuring the magnitude of an earthquake according to this function $M(x) = \log\left(\frac{x}{x_0}\right)$, where $x_0 = 10^{-3}$.

65) What is the magnitude of an earthquake whose seismographic reading is 6.8 millimeters at a distance of 100 kilometers from its epicenter? Round the answer to the nearest tenth.

65) _____

Objective: (5.4) Solve Logarithmic Equations

Solve the problem.

66) $\text{pH} = -\log_{10}[\text{H}^+]$ Find the $[\text{H}^+]$ if the $\text{pH} = 2.4$.

66) _____

Objective: (5.4) Solve Logarithmic Equations

Use the properties of logarithms to find the exact value of the expression. Do not use a calculator.

67) $\ln e^{\sqrt{6}}$

67) _____

Objective: (5.5) Work with the Properties of Logarithms

68) $\log_2 32 - \log_2 16$

68) _____

Objective: (5.5) Work with the Properties of Logarithms

69) $\log_2 27 \cdot \log_2 8$

69) _____

Objective: (5.5) Work with the Properties of Logarithms

70) $e^{\ln 13}$

70) _____

Objective: (5.5) Work with the Properties of Logarithms

Write as the sum and/or difference of logarithms. Express powers as factors.

71) $\log_4 \left(\frac{x^3}{y^8} \right)$

71) _____

Objective: (5.5) Write a Logarithmic Expression as a Sum or Difference of Logarithms

72) $\ln \sqrt[3]{ey}$

72) _____

Objective: (5.5) Write a Logarithmic Expression as a Sum or Difference of Logarithms

73) $\log_3 \frac{\sqrt[7]{16}}{q^2p}$

73) _____

Objective: (5.5) Write a Logarithmic Expression as a Sum or Difference of Logarithms

$$74) \log \left(1 - \frac{1}{x^3} \right)$$

74) _____

Objective: (5.5) Write a Logarithmic Expression as a Sum or Difference of Logarithms

Express as a single logarithm.

$$75) (\log_a x - \log_a y) + 2 \log_a z$$

75) _____

Objective: (5.5) Write a Logarithmic Expression as a Single Logarithm

$$76) 2 \log_b m - \frac{3}{5} \log_b n + \frac{1}{3} \log_b j - 3 \log_b k$$

76) _____

Objective: (5.5) Write a Logarithmic Expression as a Single Logarithm

$$77) 3 \log_a (2x + 1) - 2 \log_a (2x - 1) + 2$$

77) _____

Objective: (5.5) Write a Logarithmic Expression as a Single Logarithm

Solve the problem.

$$78) \text{ Find the value of } \log_3 4 \cdot \log_4 5 \cdot \log_5 6 \cdot \log_6 7 \cdot \log_7 8 \cdot \log_8 9$$

78) _____

Objective: (5.5) Evaluate Logarithms Whose Base Is Neither 10 Nor e

Solve the equation.

$$79) \log_5 (x + 3) = 1$$

79) _____

Objective: (5.6) Solve Logarithmic Equations

$$80) \log (3 + x) - \log (x - 5) = \log 3$$

80) _____

Objective: (5.6) Solve Logarithmic Equations

81) $\log_3 x + \log_3(x - 24) = 4$ 81) _____

Objective: (5.6) Solve Logarithmic Equations

82) $\log_2(3x - 2) - \log_2(x - 5) = 4$ 82) _____

Objective: (5.6) Solve Logarithmic Equations

83) $3 \cdot 5^{2t - 1} = 75$ 83) _____

Objective: (5.6) Solve Exponential Equations

Solve the problem.

84) The formula $A = 283e^{0.028t}$ models the population of a particular city, in thousands, t years after 1998. When will the population of the city reach 335 thousand? 84) _____

Objective: (5.6) Solve Exponential Equations

Find the present value. Round to the nearest cent.

85) To get \$5600 after 2 years at 7% compounded annually 85) _____

Objective: (5.7) Determine the Present Value of a Lump Sum of Money

86) To get \$25,000 after 12 years at 6% compounded semiannually 86) _____

Objective: (5.7) Determine the Present Value of a Lump Sum of Money

Solve the problem.

87) What principal invested at 8% compounded continuously for 4 years will yield \$1190? Round the answer to two decimal places. 87) _____

Objective: (5.7) Determine the Present Value of a Lump Sum of Money

Answer Key

Testname: 13SPR_CH5_MATH2_HW_4

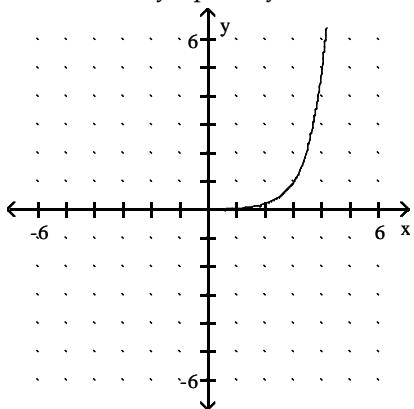
- 1) $\left\{ \frac{\ln 3}{\ln 5} - 7 \right\}$
- 2) $\left\{ \frac{\ln 7}{4} \right\}$
- 3) 1.44
- 4) 2.18
- 5) 2.27
- 6) 163
- 7) $-\frac{2}{13}$
- 8) 51
- 9) $35x - 1$
- 10) $\frac{9x}{8 - 3x}$
- 11) Yes, yes
- 12) No, no
- 13) $A(r(t)) = 9\pi t^2$
- 14) $R(x) = (25 - x)(500 + 30x)$ or $12,500 + 250x - 30x^2$
- 15) $\{x \mid x \neq -16\}$
- 16) $\{x \mid x \neq -2\}$
- 17) $\{x \mid x \neq 0, x \neq -7\}$
- 18) $\{x \mid x \geq 1, x \neq 50\}$
- 19) Yes
- 20) No
- 21) Yes
- 22) No
- 23) $\{(1, 8), (-8, -1), (5, -6), (-5, 6)\}$ $D = \{1, -8, 5, -5\}$; $R = \{8, -1, -6, 6\}$
- 24) Yes
- 25) Yes
- 26) No
- 27) $f^{-1}(x) = \frac{x + 6}{3}$
- 28) $f^{-1}(x) = \sqrt{\frac{x + 8}{5}}$
- 29) $f^{-1}(x) = \frac{5 - 7x}{3x}$
- 30) $f^{-1}(x) = \frac{-4x + 4}{x}$
- 31) $f^{-1}(x) = x^3 - 7$
- 32) $f^{-1}(x) = 2(x + 8)$
- 33) 5.462
- 34) 0.247
- 35) 0.11 mg
- 36) 661 students

Answer Key

Testname: 13SPR_CH5_MATH2_HW_4

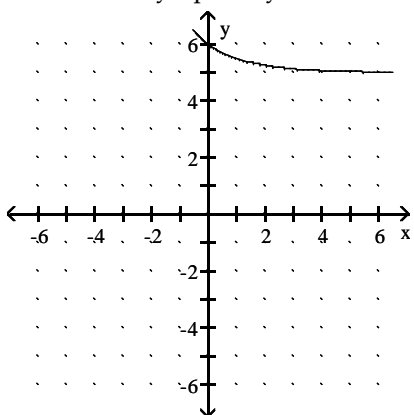
37) domain of $f: (-\infty, \infty)$; range of $f: (0, \infty)$

horizontal asymptote: $y = 0$

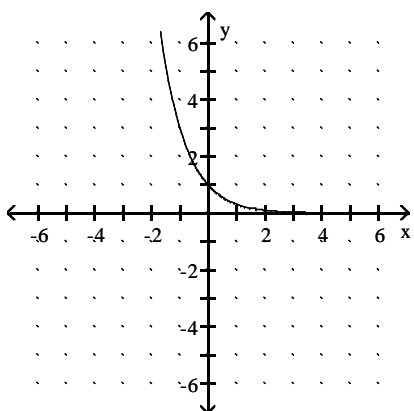


38) domain of $f: (-\infty, \infty)$; range of $f: (5, \infty)$

horizontal asymptote: $y = 5$



39)



40) $\{2\}$

41) $\{3\}$

42) $\{3, -3\}$

43) $\{-11\}$

44) $\{-4\}$

45) -3

46) $\log_7 343 = 3$

47) $\log_5 x = 2$

Answer Key

Testname: 13SPR_CH5_MATH2_HW_4

$$48) \log_{32} 2 = \frac{1}{5}$$

$$49) \left(\frac{1}{5}\right)^{-4} = 625$$

$$50) 3^2 = 9$$

$$51) 5^x = 25$$

$$52) e^4 = x$$

$$53) e^{-5} = \frac{1}{e^5}$$

$$54) -3$$

$$55) -2$$

$$56) \frac{1}{2}$$

$$57) 3$$

$$58) 0.358$$

$$59) -1.251$$

$$60) 12.08$$

$$61) \{25, -25\}$$

$$62) \{3, -1\}$$

$$63) \{e^{-1/3}\}$$

$$64) \{e^6 - 5\}$$

$$65) 3.8$$

$$66) 3.98 \times 10^{-3}$$

$$67) \sqrt{6}$$

$$68) 1$$

$$69) 3$$

$$70) 13$$

$$71) 3 \log_4 x - 8 \log_4 y$$

$$72) \frac{1}{3} \ln y + \frac{1}{3}$$

$$73) \frac{1}{7} \log_3 16 - 2 \log_3 q - \log_3 p$$

$$74) \log(x - 1) + \log(x^2 + x + 1) - 3 \log x$$

$$75) \log_a \frac{xz^2}{y}$$

$$76) \log_b \frac{m^2 j^{1/3}}{n^{3/5} k^3}$$

$$77) \log_a \frac{a^2(2x + 1)^3}{(2x - 1)^2}$$

$$78) 2$$

$$79) \{2\}$$

$$80) \{9\}$$

$$81) \{27\}$$

$$82) \{6\}$$

Answer Key

Testname: 13SPR_CH5_MATH2_HW_4

83) $\left\{\frac{3}{2}\right\}$

84) 2004

85) \$4891.26

86) \$12,298.34

87) \$864.12