Math 260 Chapter 4 & 9 Practice
Disclaimer: The actual exam is different. This is a study aid. Also, on the actual exam you will be expected to show work correctly, neatly and logically to receive any credit.

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

1) Let \( f(x) = 6x \). Find \( f(-3) \).
   1) ____________

2) Let \( f(x) = \left( \frac{1}{6} \right)^x \). Find \( f(-1) \).
   2) ____________

Graph the function. Label at least two points on the graph.

3) \( f(x) = 5^x \)
   3) ____________

Graph the function.

4) \( f(x) = \left( \frac{1}{2} \right)^x \)
   4) ____________
5) \( f(x) = 2|x| \)

Graph the exponential function using transformations where appropriate.

6) \( f(x) = 4^x + 1 \)

7) \( f(x) = -3^x - 5 \)
Write an equation for the graph given. The graph represents an exponential function \( f \) with base 2 or 3, translated and/or reflected.

8) ________

9) ________

Solve the equation.

10) \( 4(12 - 4x) = 256 \)

11) \( 4(8 - 2x) = 256 \)

12) \( 4 = b^{2/3} \)

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

14) \( (\sqrt{5})^{x + 1} = 25x \)

Provide an appropriate response.

15) Give an equation of the form \( f(x) = a^x \) to define the exponential function whose graph contains the point \((2, 16)\). Assume that \( a > 0 \).
16) Use the properties of exponents to write the function of the form \( f(t) = k a^t \), where \( k \) is a constant.
   
   \( f(t) = 33t + 2 \)

Find the future value.

17) $1972 invested for 12 years at 4% compounded quarterly

18) $23,481 invested for 11 years at 5% compounded semiannually

19) $1417.32 invested for 6 years at 4% compounded monthly

Find the present value of the future value.

20) $11,000, invested for 4 years at 3% compounded monthly

Solve the problem.

21) Find the required annual interest rate, to the nearest tenth of a percent, for $1100 to grow to $1400 if interest is compounded monthly for 7 years.

22) The growth in the mouse population at a certain county dump can be modeled by the exponential function \( A(t) = 906e^{0.012t} \), where \( t \) is the number of months since the population was first recorded. Estimate the population after 36 months.

23) The decay of 938 mg of an isotope is given by \( A(t) = 938e^{-0.022t} \), where \( t \) is time in years since the initial amount of 938 mg was present. Find the amount (to the nearest milligram) left after 96 years.

Evaluate the logarithm.

24) \( \log_{\frac{1}{5}}^{5} \)

25) \( \log_{6}^{1} \)

26) \( \log_{8}^{-1} \)

Write in logarithmic form.

27) \( 3^2 = 9 \)

28) \( \left(\frac{5}{6}\right)^3 = \frac{125}{216} \)

29) \( \left(\frac{5}{6}\right)^{-5} = \frac{7776}{3125} \)
Write an equivalent expression in exponential form.

30) \( \log_{10} 10,000,000 = 7 \)  
   \( 30) \) ________

31) \( \log_{\sqrt{8}} 512 = 6 \)  
   \( 31) \) ________

Solve the equation.

32) \( \log_6 \sqrt{6} = x \)  
   \( 32) \) ________

33) \( \log_x 625 = 4 \)  
   \( 33) \) ________

34) \( x = \log_{10} 0.01 \)  
   \( 34) \) ________

35) \( 8x - 32 = \log_x 1 \)  
   \( 35) \) ________

Graph the function. Give the domain and range. Label at least two points on the graph.

36) \( f(x) = \log_{\frac{1}{2}} x \)  
   \( 36) \) ________

Graph the function. Give the domain and range.

37) \( f(x) = \log_{\frac{1}{8}} x \)  
   \( 37) \) ________
38) \( f(x) = \log_2 (x - 1) \)

39) \( f(x) = \log_{\frac{1}{4}} (x + 2) \)
Match the function with its graph.

40) \( f(x) = \log_3 \left( \frac{x}{3} \right) \)

A) 

B) 

C) 

D)
41) \( f(x) = \log_3 (-x) \)

A)

B)

C)

D)
42) \( f(x) = \log_5 (-x) \)

A)

\[
\begin{array}{c}
\text{B)}
\end{array}
\]

C)

\[
\begin{array}{c}
\text{D)}
\end{array}
\]

Write an equation for the graph given. The graph represents an logarithmic function \( f \) with base 2 or 3, translated and/or reflected.

43)
Use the properties of logarithms to rewrite the expression. Simplify the result if possible. Assume all variables represent positive real numbers.

45) \( \log_a(7x^5y) \)

46) \( \log_5(8x + 6y) \)

47) \( \log_2 \left( \frac{5\sqrt{x}}{y} \right) \)

48) \( \log_b \left( \frac{m^9p^4}{n^3b^7} \right) \)

49) \( \log_b \left( \frac{4x^9}{z^8} \right) \)

Write the expression as a single logarithm with coefficient 1. Assume all variables represent positive real numbers.

50) \((\log_a t - \log_a s) + 4 \log_a u \)

51) \( \frac{7}{9} \log_b 4y + \frac{7}{5} \log_b (16y^2) \)

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

52) \( \log_{10} 6 \)

53) \( \log_{10} 108 \)

54) \( \log_{10} \frac{9}{8} \)
Determine the function value.

55) Suppose \( f(x) = \log_a x \) and \( f(4) = 2 \). Find \( f\left(\frac{1}{16}\right) \).

Use properties of logarithms to evaluate the expression.

56) \( 100^{\log_{10}7} \)

Solve the problem.

57) Let \( u = \ln a \) and \( v = \ln b \). Write the following expression in terms of \( u \) and \( v \) without using the function \( \ln \).

\[
\ln \left( \frac{b^4 \sqrt{a}}{7} \right)
\]

58) Let \( u = \ln a \) and \( v = \ln b \). Write the following expression in terms of \( u \) and \( v \) without using the function \( \ln \).

\[
\frac{4}{\ln (\sqrt{ab^2})}
\]

Solve the problem. Round your answer to the nearest tenth, when appropriate. Use the formula \( pH = -\log [H_3O^+] \), as needed.

59) Find the \( pH \) if \( [H_3O^+] = 5.8 \times 10^{-10} \).

Solve the problem.

60) The decibel level \( D \) of a sound is related to its intensity \( I \) by \( D = 10 \log \left( \frac{I}{I_0} \right) \). If \( I_0 \) is \( 10^{-12} \), then what is the intensity of a noise measured at 49 decibels? Express your answer in scientific notation, rounding to three significant digits, if necessary.

Use the change of base rule to find the logarithm to four decimal places.

61) \( \log_2 6 \)

Solve the equation. Round to the nearest thousandth.

62) \( 5(3x - 1) = 17 \)

63) \( 4e^{(4x + 1)} = 12 \)

64) \( e^{9x}e^{7x} = e^2 \)

Solve the equation and express the solution in exact form.

65) \( \log (x - 3) = 1 - \log x \)

66) \( \log_9 (x - 4) + \log_9 (x - 4) = 1 \)

67) \( \log 5x = \log 2 + \log (x + 2) \)
68) \( \log_2 \sqrt{2x^2 - \frac{9}{2}} \)

69) \( \log_3(\log_3 x) = 1 \)

70) \( \log_5(x+8) + \log_5(x-8) = 2 \)

**Solve the system by substitution.**

71) \( x - 7y = 4 \)
    \( x = 8y \)

**Solve the system by elimination.**

72) \( \frac{9x}{4} + \frac{y}{4} = -2 \)
    \( \frac{x}{4} + \frac{y}{4} = 0 \)

**Solve the system.**

73) \( x - y + z = 2 \)
    \( x + y + z = -4 \)
    \( x + y - z = -8 \)

**Use the given row transformation to change the matrix as indicated.**

74) \[
\begin{bmatrix}
-1 & 2 \\
7 & 0
\end{bmatrix}; 7 \text{ times row } 1 \text{ added to row } 2
\]

75) \[
\begin{bmatrix}
1 & 1 & 2 \\
-2 & 3 & -1 \\
7 & 4 & 0
\end{bmatrix}; 2 \text{ times row } 1 \text{ added to row } 2
\]

**Write the augmented matrix for the system. Do not solve the system.**

76) \( 3x + 5y = 17 \)
    \( 6x + 6y = 30 \)

77) \( 4x + 2z = 50 \)
    \( 9y - 2z = 63 \)
    \( 2x + 2y - 2z = 16 \)

**Use the Gauss–Jordan method to solve the system of equations. If the system has infinitely many solutions, give the solution with y arbitrary. Clearly annotate each step.**

78) \( 2x + y = 8 \)
    \(-2x + 3y = -16 \)
Use the Gauss-Jordan method to solve the system of equations. If the system has infinitely many solutions, give the solution with \( y \) arbitrary. Annotate each step.

79) \[
\begin{align*}
2x - 7y &= -5 \\
-2x + 7y &= 7
\end{align*}
\]

80) \[
\begin{align*}
2x + 5y &= -7 \\
-6x - 15y &= 21
\end{align*}
\]

Use the Gauss-Jordan method to solve the system of equations. If the system has infinitely many solutions, let the last variable be the arbitrary variable. Clearly annotate each step.

81) \[
\begin{align*}
7x - 3y - z &= 27 \\
x + 7y - 4z &= 25 \\
8x + y + z &= 79
\end{align*}
\]

Use the Gauss-Jordan method to solve the system of equations. If the system has infinitely many solutions, let the last variable be the arbitrary variable. Annotate each step.

82) \[
\begin{align*}
6x - y + 4z &= 25 \\
9x + 8y - 9z &= 108 \\
7x - 4y + z &= 0
\end{align*}
\]

83) \[
\begin{align*}
x - z &= -4 \\
y + z &= 3 \\
x + z &= 1
\end{align*}
\]

Solve the problem using matrices.

84) John has a jarful of quarters and nickels. There are 88 coins in the jar. The value of the coins is $13.80. How many of each type of coin are there?

85) Ellen wishes to mix candy worth $1.50 per pound with candy worth $6.42 per pound to form 24 pounds of a mixture worth $4.78 per pound. How many pounds of the more expensive candy should she use?

Find the value of the determinant.

86) \[
\begin{vmatrix}
8 & -3 \\
9 & -4
\end{vmatrix}
\]

87) \[
\begin{vmatrix}
0 & -5 \\
10 & 0
\end{vmatrix}
\]

88) \[
\begin{vmatrix}
6 & 9 & 8 \\
4 & 7 & 5 \\
7 & 3 & 7
\end{vmatrix}
\]

89) \[
\begin{vmatrix}
5 & 7 & 6 \\
7 & 6 & 3 \\
6 & 5 & 5
\end{vmatrix}
\]
Solve the equation for \( x \).

90) \[
\begin{array}{c}
3x \\
\hline
x + 4
\end{array}
= -4
\]

91) \[
\begin{array}{c}
-25 \\
\hline
1x
\end{array}
= -3
\]

A triangle with vertices at \((x_1, y_1)\), \((x_2, y_2)\), and \((x_3, y_3)\) has area equal to the absolute value of \( D \), where

\[
D = \frac{1}{2} \left| \begin{array}{ccc}
x_1 & y_1 & 1 \\
x_2 & y_2 & 1 \\
x_3 & y_3 & 1
\end{array} \right|.
\]

Find the area of the triangle having vertices at \( P, Q, \) and \( R \).

92) \( P(2, -3), Q(2, 4), R(3, 3) \)

Use Cramer's rule to solve the system of equations. If \( D = 0 \), use another method to determine the solution set.

93) \[
\begin{align*}
x - 2y &= 14 \\
5x - 1y &= 7
\end{align*}
\]

94) \[
\begin{align*}
x + 7y &= -35 \\
8x + 8y &= -40
\end{align*}
\]

95) \[
\begin{align*}
x + y &= 3 \\
x + y &= -4
\end{align*}
\]

96) \[
\begin{align*}
x + y &= 4 \\
3x + 3y &= 12
\end{align*}
\]

Find the partial fraction decomposition for the rational expression.

97) \[
\frac{9x - 42}{x^2 - 9x + 20}
\]

98) \[
\frac{4x^2 - 3x + 2}{(x - 4)(x - 1)}
\]

99) \[
\frac{3x - 31}{(x - 8)^2}
\]

100) \[
\frac{-4x^2 - 3x + 22}{(x + 4)^2(3x + 2)}
\]

101) \[
\frac{4x^3 + 8x^2 + 5x - 7}{2x^2 - x - 1}
\]
102) \(\frac{-5x^2 - 2x - 61}{(x - 3)(x^2 + 5)}\)
103) \(\frac{546x^2 + 156x}{(x^2 + 3)(x + 6)}\)

Graph the solution set of the system of inequalities.

104) \(y \leq -x^2 - 6x - 4\)
\(y \geq x^2 + 6x + 4\)

105) \(\frac{x^2}{9} + \frac{y^2}{25} \leq 1\)
\(\frac{x^2}{25} + \frac{y^2}{9} \geq 1\)
106) \( \frac{x^2}{9} - \frac{y^2}{16} \geq 1 \)
\( x^2 + y^2 \leq 36 \)

107) \( y \geq \left( \frac{1}{3} \right)^x \)
\( y \leq 8 \)

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

108) \[
\begin{bmatrix}
10 & 1 \\
-1 & 0
\end{bmatrix}
\quad \text{and} \quad
\begin{bmatrix}
0 & 1 \\
-1 & 10
\end{bmatrix}
\]

109) \[
\begin{bmatrix}
-5 & 1 \\
-7 & 1
\end{bmatrix}
\quad \text{and} \quad
\begin{bmatrix}
\frac{1}{2} & -\frac{1}{2} \\
\frac{7}{2} & -\frac{5}{2}
\end{bmatrix}
\]

Find the inverse, if it exists, for the matrix. Steps must be shown.

110) \[
\begin{bmatrix}
3 & 3 \\
-4 & 4
\end{bmatrix}
\]
Find the inverse, if it exists, for the matrix.

111) \[
\begin{bmatrix}
-1 & 0 \\
3 & 5
\end{bmatrix}
\]

112) \[
\begin{bmatrix}
2 & 1 \\
-6 & -3
\end{bmatrix}
\]

Solve the system by using the inverse of the coefficient matrix.

113) \[-5x + 3y = 8 \]
\[-2x + 4y = 20\]

114) \[3x + 5y = -10 \]
\[-3x - 6y = 9\]
Answer Key
Testname: 260CH4&9P

1) \( \frac{1}{216} \)

2) 6

3)

4)

5)
Answer Key
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6)

7)

8) \(2x + 1 + 2\)
9) \(2x + 1 + 5\)
10) \([2]\)
11) \([2]\)
12) \([-8, 8]\)
13) \[\frac{7}{4}\]
14) \[\frac{1}{3}\]
15) \(f(x) = 4x\)
16) \(f(t) = 9 \cdot 27t\)
17) \$3179.31
18) \$40,424.22
19) \$1801.05
20) \$9757.59
21) 3.5%
22) 1396
23) 113
24) -1
25) 0
26) Undefined
27) \( \log_3 9 = 2 \)

28) \( \log_{5/6} \left( \frac{125}{216} \right) = 3 \)

29) \( \log_{5/6} \left( \frac{7776}{3125} \right) = -5 \)

30) \( 10^7 = 10,000,000 \)

31) \( 8^3 = 512 \)

32) \([3]\)

33) \([5]\)

34) \([-2]\)

35) \([4]\)

36) domain: \((0, \infty)\); range: \((\infty, \infty)\)

37) domain: \((0, \infty)\); range: \((\infty, \infty)\)
38) domain: $(1, \infty)$; range: $(-\infty, \infty)$

39) domain: $(-2, \infty)$; range: $(-\infty, \infty)$

40) A
41) D
42) A
43) $\log_2(x - 1) - 1$
44) $-\log_3(-x + 2)$
45) $\log_a 7 + 5\log_a x + \log_a y$
46) $\log_5 (8x + 6y)$
47) $\log_2 5 + \frac{1}{2} \log_2 x - \log_2 y$
48) $9\log_b m + 4\log_b p - 3\log_b n - 7$
49) $\log_b 2 + \frac{9}{2}\log_b x - 4\log_b z$
50) $\log_a \left( \frac{tu^4}{s} \right)$
51) $\log_n \left( \frac{4161}{45} \right)$
52) 0.7781
53) 2.0333
54) 0.0512
55) -4
56) 49
**Answer Key**

**Testname: 260CH4&9P**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>57)</td>
<td>$7v + \frac{u}{4}$</td>
</tr>
<tr>
<td>58)</td>
<td>$u + \frac{1}{2}v$</td>
</tr>
<tr>
<td>59)</td>
<td>9.2</td>
</tr>
<tr>
<td>60)</td>
<td>$7.94 \times 10^{-8}$ watt/m$^2$</td>
</tr>
<tr>
<td>61)</td>
<td>2.5850</td>
</tr>
<tr>
<td>62)</td>
<td>$[0.920]$</td>
</tr>
<tr>
<td>63)</td>
<td>$[0.025]$</td>
</tr>
<tr>
<td>64)</td>
<td>$[0.125]$</td>
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<tr>
<td>65)</td>
<td>$[5]$</td>
</tr>
<tr>
<td>66)</td>
<td>$[7]$</td>
</tr>
<tr>
<td>67)</td>
<td>$[1.33333333]$</td>
</tr>
<tr>
<td>68)</td>
<td>$[-16, 16]$</td>
</tr>
<tr>
<td>69)</td>
<td>$[27]$</td>
</tr>
<tr>
<td>70)</td>
<td>$\sqrt{89}$</td>
</tr>
<tr>
<td>71)</td>
<td>$[89, 4]$</td>
</tr>
<tr>
<td>72)</td>
<td>$\left{(-1, 1)\right}$</td>
</tr>
<tr>
<td>73)</td>
<td>$[(-3, -3, 2)]$</td>
</tr>
<tr>
<td>74)</td>
<td>$\begin{bmatrix} -1 &amp; 2 \ 0 &amp; 14 \end{bmatrix}$</td>
</tr>
<tr>
<td>75)</td>
<td>$\begin{bmatrix} 1 &amp; 1 &amp; 2 \ 0 &amp; 5 &amp; 3 \ 7 &amp; 4 &amp; 0 \end{bmatrix}$</td>
</tr>
<tr>
<td>76)</td>
<td>$\begin{bmatrix} 3 &amp; 5 &amp; 17 \ 6 &amp; 6 &amp; 30 \end{bmatrix}$</td>
</tr>
<tr>
<td>77)</td>
<td>$\begin{bmatrix} 4 &amp; 0 &amp; 2 \ 0 &amp; 9 &amp; -2 \ 2 &amp; 2 &amp; -2 \end{bmatrix}$</td>
</tr>
<tr>
<td>78)</td>
<td>$[5, -2]$</td>
</tr>
<tr>
<td>79)</td>
<td>$\emptyset$</td>
</tr>
<tr>
<td>80)</td>
<td>$\left{\left(-\frac{5}{2}, y - \frac{7}{2}, y\right)\right}$</td>
</tr>
<tr>
<td>81)</td>
<td>$[8, 7, 8]$</td>
</tr>
<tr>
<td>82)</td>
<td>$[5, 9, 1]$</td>
</tr>
<tr>
<td>83)</td>
<td>$\left{\left(-\frac{3}{2}, \frac{1}{2}, \frac{5}{2}\right)\right}$</td>
</tr>
<tr>
<td>84)</td>
<td>47 quarters; 41 nickels</td>
</tr>
<tr>
<td>85)</td>
<td>16 lb</td>
</tr>
<tr>
<td>86)</td>
<td>$-5$</td>
</tr>
<tr>
<td>87)</td>
<td>50</td>
</tr>
</tbody>
</table>
Answer Key
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88) -29
89) -50
90) [-4, 4]
91) [-1]
92) \( \frac{7}{2} \)
93) [(0, -7)]
94) [(0, -5)]
95) Cramer’s rule does not apply since \( D = 0; \varnothing \)
96) Cramer’s rule does not apply since \( D = 0; \{(4 - y, y)\} \)
97) \( \frac{3}{x - 5} + \frac{6}{x - 4} \)
98) \( \frac{3}{x - 2} + \frac{2}{x + 2} + \frac{-1}{x - 1} \)
99) \( \frac{3}{x - 8} + \frac{-7}{(x - 8)^2} \)
100) \( \frac{2}{3x + 2} + \frac{-2}{x + 4} + \frac{3}{(x + 4)^2} \)
101) \( 2x + 5 + \frac{16}{6x + 3} + \frac{10}{3x - 3} \)
102) \( \frac{3x + 7}{x^2 + 5} + \frac{-8}{x - 3} \)
103) \( \frac{66x - 240}{x^2 + 3} + \frac{480}{x + 6} \)
104)
105)

106)

107)

108) No
109) Yes

110) \[
\begin{pmatrix}
\frac{1}{6} & \frac{1}{8} \\
\frac{1}{6} & \frac{1}{8}
\end{pmatrix}
\]
Answer Key
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111) \[
\begin{bmatrix}
-1 & 0 \\
3 & 1 \\
\frac{3}{5} & \frac{1}{5}
\end{bmatrix}
\]
112) The inverse does not exist.
113) \{ (2, 6) \}
114) \{ (-5, 1) \}