Unit 7: Logarithmic Functions
Unit Assignment

Read the course material and complete the practice questions and suggested textbook questions throughout the Unit content before working on this Unit Assignment. The following chart shows you which lesson to review if you're having difficulty with the questions in this assignment booklet.

Unit Assignment Questions	Lesson
1, 2	7A
3, 4, 5, 6, 11	7B
7, 8, 9	7C
10	7D
12	*Logic and Reasoning

*Contact your teacher if you need help with Logic and Reasoning.

For full marks, show all calculations, steps, and/or explain your answers.

Total Marks: _____ /54

1. Complete the following chart to analyze the characteristics of each logarithmic function. (10 marks – 0.5 each)

Equation	$y = \log x$	$y = 2\log x$	$y = -2\log x$	$y = \log_2 x$
Graph				
Domain				
Range				
Coordinates of intercept(s)				
End Behaviour				

2. Each of the equations below was graphed on a calculator, using the following window settings:
    X: [-10, 10, 1]
    Y: [-10, 10, 1]

    Match each equation with its corresponding graph and write the equation on the line below the graph. (3 marks – 0.5 marks each)
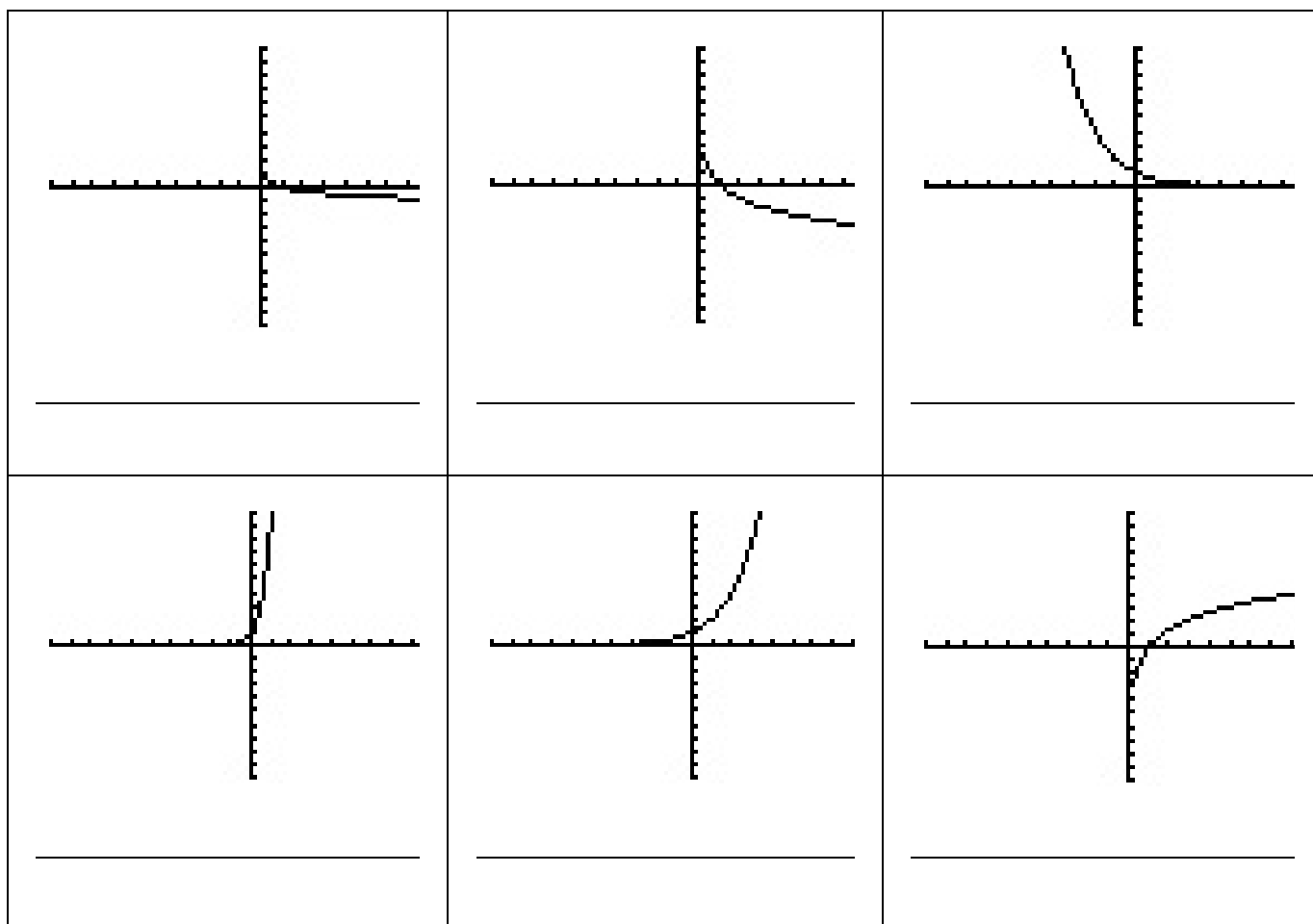
    $y = 10^x$

    $y = 2^x$

    $y = 0.5^x$

    $y = -\log x$

    $y = \log_{0.5} x$

    $y = 3\log_5 x$

3.   Write each exponential equation in logarithmic form.
   a. $y = 7^x$ (1 mark)

   b. $x = 36^y$ (1 mark)

4.   Write each logarithmic equation in exponential form.
   a. $y = \log x$ (1 mark)

   b. $y = \log_5 x$ (1 mark)

5.   Place the following logarithmic expressions in order from least to greatest. (2 marks)

   a. $\log_7 65$
   b. $\ln 10$
   c. $\log_3 100$
   d. $\log 10 + \log 100$
   e. $2 \log_5 10 - \log_5 4$

6.   A student is asked to find the value of the following logarithmic function without using technology. Explain how the student can do this, showing all steps and the correct answer. (2 marks)

$$y = \log_6 1296$$

7. Match the expanded logarithmic expression in the left column with the simplified form of the expression in the right column. (6 marks)

Expanded Form		Simplified Form	
a.	$\log_b A + \log_b B$	**i.**	$\log_b \left(A^C B \right)$
b.	$\log_b A - \log_b B$	**ii.**	$\log_b \left(ABC \right)$
c.	$C \log_b A + \log_b B$	**iii.**	$\log_b \left(\dfrac{AC}{B} \right)$
d.	$\log_b A - \log_b B + \log_b C$	**iv.**	$\log_b \left(\dfrac{A}{B} \right)$
e.	$\dfrac{\log_b A}{\log_b C}$	**v.**	$\log_b \left(AB \right)$
f.	$\log_b A + \log_b B + \log_b C$	**vi.**	$\log_C A$

a. _____   b. _____   c. _____

d. _____   e. _____   f. _____

8. Solve the following logarithmic equations algebraically. Express your answers to the nearest hundredth, if necessary. (5 marks – 1 mark each)

a. $\log x = 4$ b. $\log_x 125 = 3$

c. $\log_2 x = -4$ d. $\log_4 8 = x$

e. $\log_9 9^x = -2$

9. Solve the following exponential equations, algebraically using logarithms. Then, check your answer using technology. Express your answers to the nearest tenth.

a. $3^x = 70$	b. $4^{x-3} = 11$	c. $5^{x+3} = 2^{x+6}$
Algebraically (2 marks)	**Algebraically** (2 marks)	**Algebraically** (2 marks)
Graphically (1 mark)	**Graphically** (1 mark)	**Graphically** (1 mark)
$y_1 = $ _____	$y_1 = $ _____	$y_1 = $ _____
$y_2 = $ _____	$y_2 = $ _____	$y_2 = $ _____
Coordinates of intersection (_____, _____)	Coordinates of intersection (_____, _____)	Coordinates of intersection (_____, _____)
Solution $x = $ _____	Solution $x = $ _____	Solution $x = $ _____

10. The Spanish flu was a worldwide epidemic that began in 1918 and lasted approximately 2 years. During the first few months of the epidemic, the flu spread rapidly through a Canadian city as shown in the table below.

Time (months)	Number of Confirmed Cases
0	150
1	345
2	828
3	2484
4	6707
5	14084

a. Determine the equation of the exponential regression function, in the form $C = ab^t$, that **models the number of confirmed cases, C, as a function of time, t.** Express the values of a and b to the nearest hundredth. (2 marks)

b. Use the exponential regression equation to determine the time that it will take, to the nearest tenth of a month, for the number of confirmed cases to equal 20 000. Show or explain how you found the answer for full marks. (2 marks)

c. Determine the equation of the logarithmic regression function $t = a + b\ln C$, that **models time, t, as a function of confirmed cases, C.** Express the values of a and b to the nearest hundredth. (2 marks)

d. Use the logarithmic regression equation to determine the time it will take, to the nearest tenth of a month, for the number of confirmed cases to equal 20 000. Show your work for full marks. (2 marks)

11. The pH of a solution can be determined using the formula $pH = -\log\left[H^+\right]$, where H^+ is the hydrogen ion concentration in the solution.

    a.   The hydrogen ion concentration of a solution is 0.012 mol/L. Calculate the pH of the solution, to the nearest tenth. (1 mark)

    b.   A baking soda solution has a pH of 7.8. Algebraically determine the hydrogen ion concentration of this solution. Show all your work and express your answer in scientific notation to the nearest tenth. (2 marks)

12. Patterns and Games: Describing Number Patterns

    Three rows of a number pattern are shown below.

    Row 1 $1 \times 10 + 1 = 11$
    Row 2 $12 \times 10 + 2 = 122$
    Row 3 $123 \times 10 + 3 = 1233$

    a.   Identify and describe the pattern used in the first three rows. (1 mark)

    b.   Use the pattern you described above to write out Row 9. (1 mark)

End of Assignment