Unit 6: Exponential 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 Question	Lesson
1, 2, 3	6A
4	6B
5, 6, 7, 8	6C
9	*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: _____/50

1. Which of the following is an exponential function? Give a reason for your answer. (1 mark)

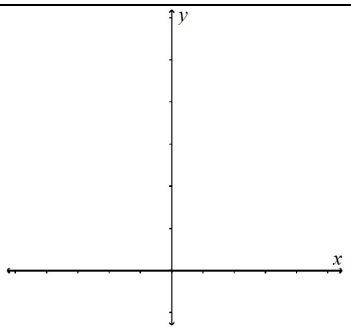
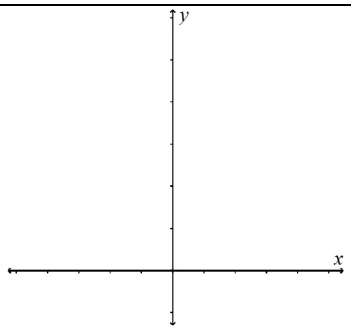
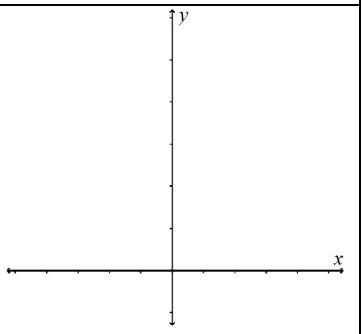
   i. $y = 8 - 16x$

   ii. $y = -7x^2$

   iii. $y = \frac{2}{3x}$

   iv. $y = 4\left(\frac{1}{2}\right)^x$

2. Complete the following chart to analyze the characteristics of each exponential function. (18 marks)

Equation $y = ab^x$	$y = (2.5)^x$	$y = 4(2)^x$	$y = 3\left(\frac{1}{2}\right)^x$
Value of *a*			
Value of *b*			
Graph			
Domain			
Range			
Coordinates of intercept(s)			

3. Consider an exponential equation $y = ab^x$. Describe the effects the following changes will have on the graph of $y = ab^x$.

   a. The value of a is changed from 1 to 3. (1 mark)

   b. The value of b is changed from 2 to $\frac{1}{5}$. (1 mark)

4. Complete the table below by solving each equation algebraically (expressing both sides with the same base) and graphically (using technology).

a. $(3)^{x-1} = 27$	b. $(4)^{3x} = 32$	c. $(125)^{2x+4} = (25)^{2x-1}$
Algebraically (2 marks)	**Algebraically** (2 marks)	**Algebraically** (2 marks)
Graphically (1 mark) y_1 = _____ y_2 = _____ Coordinates of intersection (_____, _____) Solution x = _____	**Graphically** (1 mark) y_1 = _____ y_2 = _____ Coordinates of intersection (_____, _____) Solution x = _____	**Graphically** (1 mark) y_1 = _____ y_2 = _____ Coordinates of intersection (_____, _____) Solution x = _____

5. Write an exponential equation, in the form $y = ab^x$, to model each of the following situations.
   a. The cost of a home is \$350 000 and it increases at a rate of 2.5%/a (per annum). Represent the cost of the home, $C(t)$, after t years. (1 mark)

   b. A car is valued at \$23 000 when it is first purchased, and it depreciates by 12% each year after that. Represent the value of the car, $V(n)$, after n years. (1 mark)

   c. There are 250 bacteria at the start of a science experiment, and this amount doubles every hour. Represent the total number of bacteria, $T(h)$, after h hours. (1 mark)

   d. The population of fish in a lake is 5000 and it increases by 7% each year. Represent the population of fish, $P(t)$, after t years. (1 mark)

6. A student deposited money into a savings account. The following equation models the amount of money in the account, $A(t)$, after t years. $A(t) = 1575(1.045)^t$
   a. State the initial amount of money deposited into the account. (1 mark)

   b. Determine the annual interest rate being paid on the account. (1 mark)

   c. Use the equation to find the amount of money, to the nearest dollar, in the account after 15 years. (1 mark)

   d. How many years, to the nearest whole year, will it take for the account to have **at least** \$4000? (1 mark)

7. The population of a city has been growing exponentially. The table below shows the population every ten years, starting in 1950.

Year	1950	1960	1970	1980	1990	2000	2010
Population	199 499	243 128	296 371	361 275	440 392	536 835	654 399

a. Find the exponential regression equation in the form $P(t) = ab^t$, where $P(t)$ is the population and t is the number of years since 1950 (**1950 is year 0**). Express the values of a and b to the nearest hundredth. (2 marks)

b. Calculate the population, to the nearest whole number, in 1985. (2 marks)

c. Assuming that the growth rate remains the same, during what year will the population reach 1 000 000? (1 mark)

8. The energy released during an earthquake can be calculated using the formula $E(M) = \left(10^{1.5}\right)^{M}$, where E is the energy in kWh (kilowatt hours) and M is the magnitude of the earthquake.

   a. The magnitude 9.5 earthquake in Southern Chile on May 22, 1960 is thought to be the strongest earthquake that has ever occurred. Use the formula above to calculate the energy released during this earthquake. Express the answer in scientific notation, to the nearest tenth. (1 mark)

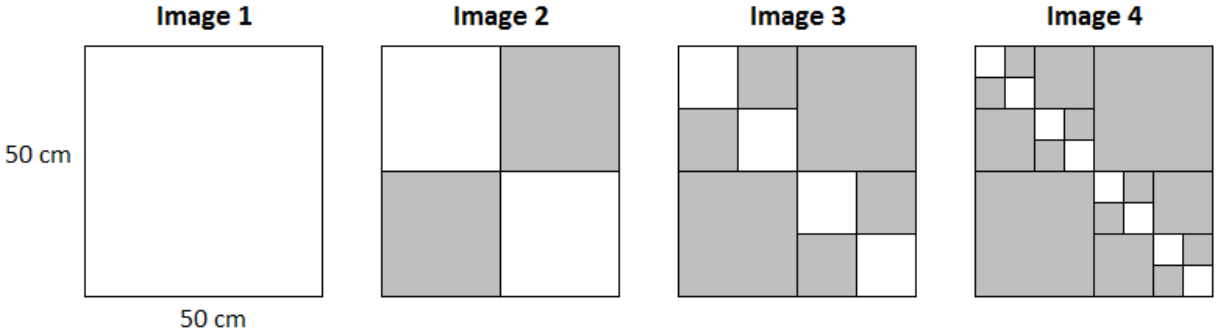
   b. An earthquake of magnitude 3 may not be felt or noticed by most people. Calculate the energy, to the nearest tenth, that is released during an earthquake of this strength. (1 mark)

   c. Compared to a magnitude 3 earthquake, how many times greater was the energy that was released during the 1960 earthquake in Chile? (1 mark)

   d. An earthquake that occurred in Central Canada in 2010 released approximately 30 000 000 kWh energy. Find the magnitude, to the nearest whole number, associated with this earthquake. (1 mark)

9. Patterns and Games: Complete the Pattern

   The following images form a pattern.



   Find the area of the shaded region in Image 4. (3 marks)

End of Assignment