MCR3U - Unit 2 Test

Question Sheet

Name: _____ **Mark:** _____ **/ 30**

K&U	A	T	C
_____ / 9	_____ / 9	_____ / 6	_____ / 6

Section I

Part A: Knowledge - Multiple Choices (3 marks, 1 mark per each)

- Identify the choice that **best** answers the question.

1. Which of the following is equivalent to 1?

   A. $1^3 + 1^2$ B. $(-1)^3$ C. $5^{-4} \times 5^4$ D. $\frac{13^4}{13^{-4}}$

2. What is $\sqrt[3]{(-125)^4}$ in exponent form?

   A. $(-5)^{\frac{4}{3}}$ B. $(-125)^{\frac{3}{4}}$ C. $(125)^{-\frac{3}{4}}$ D. $(-125)^{\frac{4}{3}}$

3. Simplify $(x^{-4})\,(x^{-3})(x^2)$. Express your answer using only POSITIVE exponents.

   A. x^{-5} B. x^{24} C. $\frac{1}{x^5}$ D. x^{11}

Part B: Knowledge - Fill in Blanks (6 marks, 1 mark per each)

4. Given the exponential function $f(x) = 5^x$, identify its key properties (6 marks):

   1) horizontal asymptote:_____ 2) x-intercept: _____

   3) y-intercept: _____ 4) increasing / decreasing interval: _____

5. Simplify and evaluate the following expressions with exponents.
   Please show your work and write your final answers with POSITIVE exponent(s).

   1) $(9n^4)^{\frac{3}{2}}$ 2) $\frac{(-2x^{-2}y)^2}{4x^2y^{-3}}$

Part C: Short Answers - Application (9 marks)

- Apply your knowledge learned in this unit to solve the following problems.
- The question requires mathematical calculations, so please show all of your work.

6. Apply your knowledge regarding exponent rules to solve the following exponent equations. (3 marks)

   1) $8^{(a+3)} = 2^{6a}$ 2) $27^{2(x+1)} = 9^x$ 3) $5^{n+3} - 5^{n+2} = 2500$

7. Wes borrows $850 from the bank at a rate of 9.5% interest per year, compounded annually. (2 marks)

   a) After 3 years, evaluate the amount of money that Wes has to repay the bank. (1 mark)

   b) After 3 years, evaluate how much interest Wes will have to pay the bank. (1 mark)

8. A 300g sample of the element Th-234 has a half-life of 10 days. (4 marks)

   1) Use a formula to represent the change in the mass of Th-234 over time. Explain the meaning of the variables you used in the formula. (2 marks)

   2) Evaluate the remaining mass of Th-234 after 30 days. (1 mark)

   3) Evaluate the number of days it will take for the initial mass of Th-234 to decay to 75g. (1 mark)

Section II

Part D: Short Answers - Thinking (6 marks)

9. Given g(x) = $-3 \times 2^{2x-2} + 1$,

   1) Analyze the parameters and describe how g(x) is transcribed from its parent function. (2 marks)

   2) Find the mapping rule $(\frac{x}{k} + d, ay + c)$ and sketch the graph of g(x). (2.5 marks)

      Notice: the coordinates of five original points and five transformed points must be included.

   3) Analyze the following key properties of g(x). (1.5 marks)

      a. horizontal asymptote
      b. range
      c. y-intercept

Part E: Short Answers - Communication (6 marks)

10. Given the three data sets below, discuss and classify the relationship between each investment and time as linear, quadratic, or exponential growth. Explain your reasoning. (4 marks)

Time	Investment
Year 0	$1000
Year 1	$1100
Year 2	$1210
Year 3	$1331
Year 4	$1464.1

Time	Investment
Year 0	$1000
Year 1	$1100
Year 2	$1200
Year 3	$1300
Year 4	$1400

Time	Investment
Year 0	$1000
Year 1	$1210
Year 2	$1440
Year 3	$1690
Year 4	$1960

11. Compare the exponential function $f(x) = (\frac{1}{3})^x$ and $g(x) = (\frac{1}{5})^x$, discuss which of the function has a greater rate of change? Explain your reasoning. (2 marks)