MCR3U - UNIT 4 TEST
Exponential Functions

Name : _____

PART A : Knowledge

1. Simplify then evaluate the following expression. Show all your work. Decimal answers will not be accepted.

$$\left(\frac{1}{64}\right)^{-1/3} + \left(\frac{25}{9}\right)^{1/2} - (27)^{\frac{-2}{3}}$$

[4]

2. Simplify each of the following expressions. Express your final answer in radical form when applicable.

a) $\dfrac{(m^3n)^3}{(-2m^2n^5)^4}$

[3]

b) $\dfrac{25a^{-2/3}b^{3/4}}{75a^{1/2}b^{-2}}$

[4]

c) $\dfrac{\left(2x^{2/3}\right)^{-2}}{\left(xy^2\right)^{2/3}} \times \dfrac{2y^2}{3x^{-5}}$

[5]

3. Evaluate the following expression for x = -3 and n = 2

$$\frac{\left(x^{2n-1}\right)\left(x^{3n-1}\right)}{x^{2n-5}}$$

[3]

4. Simplify. Express answer in rational form with positive exponents.

$$\left(\frac{\sqrt{64a^{12}}}{\left(a^{1.5}\right)^{-6}}\right)^{\frac{2}{3}}$$

[4]

5. Evaluate. Express answer in rational form.

$$\frac{-\sqrt[3]{512}}{\sqrt[5]{-1024}}$$

[3]

PART B : Application

6. For each of the following exponential functions, write a description of the graph of the function (compared to $f(x) = 2^x$, the dotted graph), then write in function notation, and state the domain, range and asymptote. Finally, sketch the graph in the space provided.

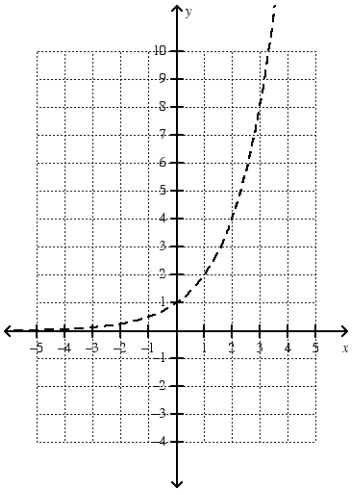
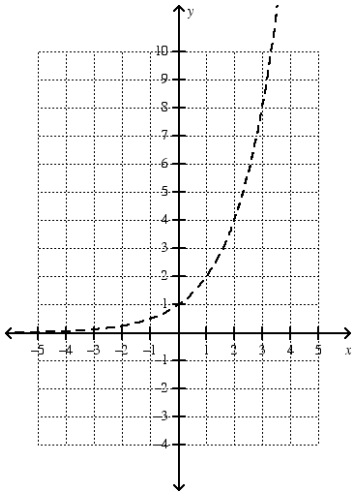
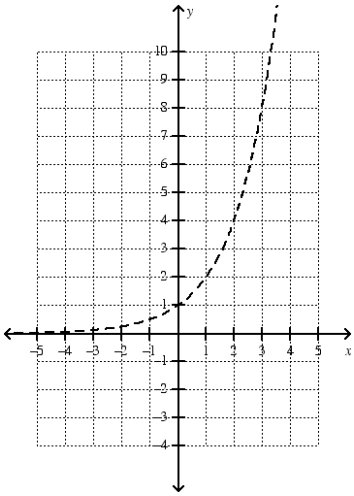
Equation	$y = 2^{-x} - 2$	$y = -(2^{2x}) + 7$	$y = 2(2^{x+1})$
Description *(State the transformations.)* State the mapping rule [3 x 3K]			
Rewrite the Equation in Function Notation [3 x 1K]	where $f(x) = 2^x$	where $f(x) = 2^x$	where $f(x) = 2^x$
State the Domain, Range & equation of the Asymptote [3 x 3K]			
Sketch the graph, identifying the asymptote with a dotted line [2 x 3K]			

Table of values	(,) → (,) (,) → (,) (,) → (,)	(,) → (,) (,) → (,) (,) → (,)	(,) → (,) (,) → (,) (,) → (,)

FORMULAS

$$N(t) = N_0(2)^{t/d} \qquad M(t) = M_0\left(\frac{1}{2}\right)^{t/h} \qquad A = A_0(1+i)^n$$

7. A strain of yeast cell doubles under certain conditions every 40 minutes. If there were 25 cells initially, how many will there be in 5 hours? How many will there be in *n* hours?

[4]

8. Health officials found traces of Radium F beneath the local library. After 3 hours they observed that a certain amount of the substance had decayed to $\frac{1}{\sqrt{32}}$ of its original mass. Determine the half-life of Radium F *in minutes*.

[4]

9. Nada deposits $5000 in an account that pays 10% per annum for 10 years.
    a. What is the growth rate?
    b. What is the initial amount?
    c. How many growth periods are there?
    d. Write an equation that models the growth of the investment, and use it to determine the value of the investment after 10 years.

[5]

BONUS:

Evaluate $\sqrt{\left[\left(3-\frac{17}{27}\right)^{-1/3}+1\right]^{-1}}$. Show all your work. Give final answer in exact simplified form.