MCT 4C Test 3 Review: Exponents and Logarithms **Name: _____**

1. Simplify.

   a. $(a^3b^4)^2$

   b. $\dfrac{(4m^3n^6)(5m^2n^4)}{10mn^8}$

   c. $(40x^6) \div (8x^{-3})$

2. How are the graphs of $y = 2^x$ and $y = 2^{-x}$ related?

3. List the similarities and differences between the graphs of $y = 3^x$ and $y = 4^x$.

4. List the similarities and differences between the graphs of $y = 3^{-x}$ and $y = \left(\frac{1}{3}\right)^x$

5. Simplify. Use only positive exponents in your answers.

   a) $(-3d)^4$ b) $\dfrac{9m^2n^3}{6m^2n^4}$ c) $\sqrt{x^4y^{16}}$ d) $(6x^3y^2)(2x^2y^4)^{-2}$

6. Express $100^{\frac{3}{4}}$ as a radical.

7. Write in radical form and evaluate.

   a. $81^{\frac{3}{4}}$ b. $(-27)^{\frac{2}{3}}$

8. Express $\sqrt[3]{(-64)^5}$ as a power with a rational exponent.

9. Describe how to use Desmos to solve $2^x = 25$.

10. For functions of the form $f(x) = a^x$, state which values of a will result in each of the following types of graph.

    a) a graph that represents an increasing function

    b) a graph that represents a decreasing function

    c) a graph that cannot be defined

11. Solve the following equations using a common base.

    a) $2^x = 64$ **b)** $3^x = \frac{1}{81}$ **c)** $64^x = 16^{x+3}$ d) $8^{4x-3} = 4$ e) $2^{x+3} = 4^{x-1}$

12. Write in exponential form.

    a. $\log_3 \frac{1}{9} = -2$ b. log 1000 = 3

13. Write in logarithmic form: $7^0 = 1$.

14. Evaluate **without a calculator**. Show your steps where necessary.

    a) $\log_9 81$ b) $\log_x x^2$ c) $\log_5 0.008$

    d) $\log_4 \frac{1}{4}$ e) $\log_3 9\sqrt{3}$ f) $\log_6 9 + \log_6 4$

15. Evaluate $\log_5 21$. Show your steps.

16. Explain why there is no solution to the equation $\log_5(-125) = x$.

17. Solve for x (to 2 decimal places where necessary).

a) $\log_3 x = 2$

b) $6^x = 356$

c) $\log_2 x = \log_2 4 - \log_2 3$

d) $3\log_6 x = \log_6 125$

e) $15^{\frac{x}{3}} = 1000$

f) $\log(x-4) = 1$

18. Evaluate using the laws of logarithms. Show your steps.

$$3\log_{16} 2 + 2\log_{16} 8 - \log_{16} 2$$

19. Suppose you want to invest $3000 in savings certificates which bear an interest rate of 9.25% compounded annually.

    a) How long will it take to save $3700?

    b) How long will it take to double your money?

20. Find the hydrogen ion concentration in a substance that has a pH of 3.

21. The sound level on a local highway is 91 dB. The sound level on the runway at a small airport is about 6420.4 as intense. Determine the sound level on the runway.

22. How many times as intense as a standard earthquake is an earthquake measuring 4.3 on the Richter Scale?