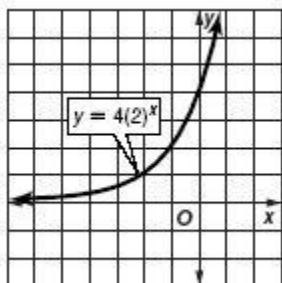NAME ___Key___ DATE _____ PERIOD _____

Practice for Finals – Logs Due Friday, April 30

1. Find the domain and range of the function whose graph is shown.

$y = 4(2)^x$

d: all real #s

r: r $y \geq 0$

2. Which function represents exponential growth?

F. $y = 9\left(\dfrac{1}{3}\right)^x$ **G.** $y = 4x^4$ **H.** $y = 12\left(\dfrac{1}{5}\right)^x$ **J.** $y = 10(2)^x$

3. The graph of which exponential function passes through the points (0, 4) and (1, 24)?

A. $y = 4(6)^x$ **B.** $y = 3(8)^x$ **C.** $y = 2(2)^x$ **D.** $y = 10(3)^x$

4. Simplify $\left(x^{\sqrt{7}}\right)^{\sqrt{3}}$. $x^{\sqrt{21}}$

$$\left(x^a\right)^5 = x^{10}$$

5. Solve $2^{3m-4} > 4$. $2^{3m-4} > 2^2$

$3m - 4 > 2$
$3m > 6$
$m > 2$

6. Write the equation $4^3 = 64$ in logarithmic form.

$\log_4 64 = 3$

7. Write the equation $\log_{12} 144 = 2$ in exponential form.

$12^2 = 144$

8. Evaluate $\log_2 8$.

$2^x = 8$

$x = 3$

9. Solve $\log_3 n = 2$.

$3^2 = n$

$n = 9$

11. Solve $\log_6 10 + \log_6 x = \log_6 40$.

$\log_6 10x = \log_6 40$

$10x = 40$

$x = 4$

12. Solve $4^x = 20$. Round to four decimal places.

$\log_4 20 = x$

$\dfrac{\log 20}{\log 4} = x$

$x \approx 2.1610$

13. Express $\log_9 22$ in terms of common logarithms.

A. $\log \dfrac{22}{9}$ **B.** $\log 198$ **C.** $\dfrac{\log 22}{\log 9}$ **D.** $\dfrac{\log 9}{\log 22}$

14. **AUTOMOBILES** Lydia bought a car for \$20,000. It is expected to depreciate at a rate of 10% per year. What will be the value of the car in 2 years? Use $y = a(1 - r)^t$ and round to the nearest dollar.

$y = P(1 \pm r)^t$

$y = 20{,}000(1 - .10)^2 = \$16{,}200$

15. **ART** Martin bought a painting for \$5,000. It is expected to appreciate at 4% per year. How much will the painting be worth in 6 years? Use $y = a(1 + r)^t$ and round to the nearest cent.

$y = 5000(1 + .04)^6$

$y = \$6326.60$

1. **Evaluate** $3\log_2 64 + 2\log_3 9 + \log_{\frac{1}{5}} 25$

$$3\log_2 64 = x \qquad 2\log_3 9 = x$$

$$2^x = 64^3 \qquad\qquad 3^x = 9^2 \qquad \log_{\frac{1}{5}} 25 = x$$

$$2^x = (2^6)^3 \qquad\quad 3^x = 3^4 \qquad \left(\frac{1}{5}\right)^x = 25$$

$$\qquad\qquad\qquad\qquad x = 4 \qquad\quad 5^{-x} = 5^2$$

$$18 + 4 + (-2) = \boxed{20} \qquad x = 18 \qquad\qquad\qquad -x = 2$$
$$x = -2$$

Demonstrate your knowledge by giving a clear, concise solution to each problem. Be sure to include all relevant drawings and justify your answers. You may show your solutions in more than one way or investigate beyond the requirements of the problem.

2. **a.** Solve the exponential equation $3^{5x} = 9^{x+6}$ by rewriting the equation so that each side has the same base.

$$3^{5x} = 3^{2(x+6)} \qquad\qquad 5x = 2x + 12$$
$$3x = 12$$
$$\boxed{x = 4}$$

$$\log 3^{5x} = \log 9^{x+6}$$

b. Solve the equation in part **a** using common logarithms.

$$\frac{5x \log 3}{\log 3} = \frac{(x+6) \log 9}{\log 3} \qquad \frac{5x}{x+6} = \frac{\log 9}{\log 3} \qquad \frac{5x}{(x+6)} = 2 \qquad 5x = 2x+12$$
$$3x = 12$$
$$\boxed{x=4}$$

$$5x \log 3 = x \log 9 + 6 \log 9$$

$$x(5\log 3 - \log 9) = 6 \log 9$$

$$x = \left(\frac{6 \log(9)}{5\log(3) - \log(9)}\right) = \boxed{4}$$