Name: KEY Per. ____

Pre-Calculus Test Chapter 3 **Form A** **Show ALL work!!!**

1 Write the logarithmic equation in exponential form.

$\log_7 \frac{1}{49} = -2$

$7^{-2} = \frac{1}{49}$

2 Solve the exponential equation algebraically.

$7 - 2e^x = 5$

$-7 \quad -7$

$-2e^x = -2$

$\frac{-2e^x}{-2} = \frac{-2}{-2}$

$e^x = 1$

$\ln e^x = \ln 1$

$x = 0$

3 Solve for x.

$2^{x-2} = \frac{1}{32}$

$2^{x-2} = \frac{1}{2^5}$

$2^{x-2} = 2^{-5}$

$x - 2 = -5$

$+2 \quad +2$

$x = -3$

4 Expand the logarithmic expression.

$\ln \frac{x^4\sqrt{y}}{z^5}$

$= \ln x^4 y^{1/2} - \ln z^5$

$= \ln x^4 + \ln y^{1/2} - \ln z^5$

$= 4\ln x + \frac{1}{2}\ln y - 5\ln z$

5 Write the exponential equation in logarithmic form.

$81^{\frac{1}{4}} = 3$

$\log_{81} 3 = \frac{1}{4}$

6 Describe the transformation from the graph of f to the graph of g.

$f(x) = 3^x \quad g(x) = -3^{x-2} + 5$

Reflect over the x-axis, shift two units to the right and 5 units up.

OR

Shift two units to the right and five units up. Then reflect over the line $y = 5$.

7 Find the exact value of the logarithmic expression.

$\log_2 \sqrt[4]{8}$

$\log_2 8^{1/4}$

$\log_2 (2^3)^{1/4}$

$\log_2 2^{3/4} = \frac{3}{4}$

8 Solve the logarithmic equation algebraically.

$\frac{3 \ln 5x}{3} = \frac{10}{3}$

$\ln 5x = \frac{10}{3}$

$\log_e 5x = \frac{10}{3}$

$\frac{e^{\frac{10}{3}}}{5} = \frac{5x}{5}$

$x = \frac{e^{10/3}}{5}$

OR

$x = 5.606$

9 Solve the exponential equation algebraically.

$\frac{4(3^x)}{4} = \frac{20}{4}$

$3^x = 5$

$\log_3 3^x = \log_3 5$

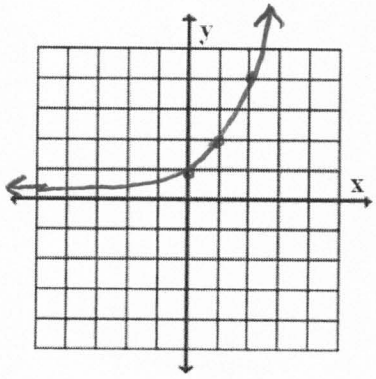
$x = \log_3 5$

OR

$x = 1.465$

10 Sketch the graph of the exponential function. State the domain, y-intercept, and horizontal asymptote.

$f(x) = 2^x$



Domain: $\mathbb{R}$ or $(-\infty, \infty)$

y-intercept: $(0,1)$

Horizontal Asymptote. $y = 0$

11 **Trust Fund** On the day of a child's birth, a deposit of \$25,000 is made in a trust fund that pays 8.75% interest, compounded continuously. How long will it take the balance to double?

$\frac{50,000}{25,000} = \frac{25,000e^{.0875t}}{25,000}$

$2 = e^{.0875t}$ $\quad t = 7.92$

$\frac{\log_e 2}{.0875} = \frac{.0875t}{.0875}$ OR $\quad t = \frac{\ln 2}{.0875}$

12 Rewrite the logarithm in a form that you could evaluate on a calculator.

$\log_3 7$

$\frac{\log 7}{\log 3}$

13 Write the logarithmic equation in exponential form.

$\ln 1 = 0$

$\log_e 1 = 0$

$e^0 = 1$

14 Expand and simplify the logarithmic expression.

$\log_5 \frac{1}{250}$

$\log_5 1 - \log_5 250$

$0 - \log_5 2 \cdot 125$

$0 - [\log_5 2 + \log_5 125]$

$-\log_5 2 - \log_5 5^3$

$-\log_5 2 - 3$

OR

15 Describe the transformation from the graph of f to the graph of g.

$f(x) = \log_6 x$ $\quad g(x) = -\log_6 (x+2)$

Reflects over the x-axis and shifts two units to the left.

OR

Shift two units to the left then reflect over the x-axis or the line $y = 0$.

16 Condense the logarithmic expression.

$\log a - 2 \log b + 3 \log c$

$\log a - \log b^2 + \log c^3$

$\log \frac{a}{b^2} + \log c^3$

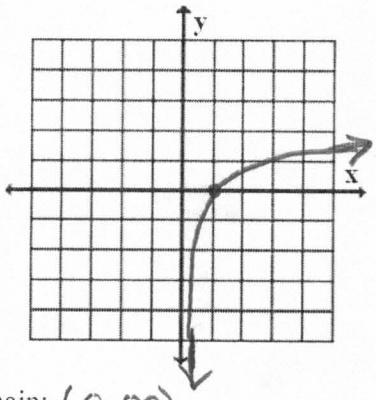
$\log \frac{ac^3}{b^2}$

17 State the letter that represents the natural base along with its numerical approximation.

$e \approx 2.718$

18 Sketch the graph of the logarithmic function. State the domain, x-intercept, and vertical asymptote.

$f(x) = \log_4 x$



Domain: $(0, \infty)$

x-intercept: $(1, 0)$

Vertical Asymptote. $x = 0$

19 **Monthly Payment** The model

$$t = 12.542 \ln\left(\frac{x}{x - 1000}\right), \quad x > 0$$

approximates the length of a home mortgage of $150,000 at 8% in terms of the monthly payment. In the model, t is the length of the mortgage in years and x is the monthly payment in dollars. If the monthly payment is $1,100.65, then it will take 30 years to pay off the home. If it takes 30 years to pay off the home, then the total amount paid is $396,234. What is the total interest paid if the monthly payment is $1,100.65? Explain how you solved the problem and why the data is important.

396,234
- 150,000

$246,234

To determine the interest you take the total amount paid subtract the mortgage loan. The data is important because it shows how much banks make for doing nothing. while the person who took the loan slaves away.

20 Determine the balance A for $5,000 dollars invested at rate 10% for 3 year and compounded 1 time per year.

$$A = 5{,}000\left(1 + \frac{.1}{4}\right)^{(4)(3)}$$

$$= 5{,}000\,(1.3449)$$

$A = \$6{,}724.44$