Pre-Calculus/Trig
UNIT 3: Exponential & Logarithmic Functions - REVIEW

Name: _____
Date: _____

PART 1: Given each function, provide an example of a graph that will match each description. (NC)

1.) DESCRIPTION	$f(x) = 3^x$	$g(x) = \log(x)$
Horizontal shift LEFT		
Horizontal shift RIGHT		
Vertical shift UP		
Vertical shift DOWN		
Reflection over the x-axis		
Reflection over the y-axis		
Vertical stretch		
Vertical shrink		
Horizontal stretch		
Horizontal shrink		

PART 2: Rewrite each exponential equation in logarithmic form. (NC)

2.) $5^x = 625$ _____

3.) $10^x = 1000$ _____

4.) $e^3 = 20.085$ _____

5.) $u^v = w$ _____

PART 3: Rewrite each logarithmic equation in exponential form. (NC)

6.) $\log_2 \frac{1}{8} = -3$ _____

7.) $\ln 143 = x$ _____

8.) $\log_4 64 = 3$ _____

9.) $\log \frac{1}{100} = -2$ _____

PART 4: Evaluate. (NC)

10.) $\log_4 128 =$ _____

11.) $\ln e^3 =$ _____

12.) $\log 10^2 =$ _____

13.) $2^{3 \log_2 5} =$ _____

14.) $e^{\ln 12} =$ _____

15.) $10^{\log 4} =$ _____

PART 5: Evaluate using Change-of-Base formula. (C)

16.) $\log_3 8 =$ _____

17.) $\log_5 12 =$ _____

18.) $\log_2 7 =$ _____

NOTE: (NC) → Non-Calculator Section (C) → Calculator Section

PART 6: Expand each logarithmic expression. Your answer may not contain any expressions or radicals. (NC)

19.) $\log\left(\frac{32x^3\sqrt{y+1}}{9z^2}\right)$

20.) $\ln\left(\frac{yz\sqrt{x}}{w}\right)$

PART 7: Condense each logarithmic expression. (NC)

21.) $1 + 3\log x + 2\log y + \frac{1}{2}\log z$

22.) $3\ln x + 2\ln 5 - \ln(x+2)$

PART 8: Solving Exponential Equations. Round to the nearest thousandth. (C)

23.) $3^{x-2} = 27$

24.) $5e^{-x} + 9 = 6$

25.) $4(5^{x+2}) = 32$

26.) $2^{x+3} = 5^{3x-1}$

27.) $10^{5x+2} = 5^{4-x}$

28.) $\frac{50}{1+10e^{-3x}} = 40$

PART 9: Solving Logarithmic Equations. Round to the nearest thousandth. (C)

29.) $\log_4(x-1)=2$

30.) $\ln x=2$

31.) $\log x=6$

32.) $\log_3(x+5)=5$

33.) $\log_3 x+\log_3(x-8)=2$

34.) $\log_4 x-\log_4(x-1)=\frac{1}{2}$

35.) $\log_3(5x-1)=\log_3(x+7)$

36.) $\log_6(3x+14)-\log_6 5=\log_6 2x$

37.) $\log_2 3x=\log_4 x$

38.) $\log_4(x+1)+\log_{16}(x+1)=\log_4 8$

PART 10: Application Problems.

INTEREST COMPOUNDED PERIODICALLY	INTEREST COMPOUNDED CONTINUOUSLY	PRESENT VALUE ANNUITY	FUTURE VALUE ANNUITY
$A = P\left(1 + \frac{r}{n}\right)^{nt}$	$A = Pe^{rt}$	$P_n = p\left[\frac{1 - \left(1 + \frac{r}{n}\right)^{-nt}}{\left(\frac{r}{n}\right)}\right]$	$F_n = p\left[\frac{\left(1 + \frac{r}{n}\right)^{nt} - 1}{\left(\frac{r}{n}\right)}\right]$

39.) Emily plans to put her graduation money into an account and leave it there for 4 years while she goes to college. She receives $1,050 in graduation money to college that she puts into an account that earns 4.25%. How much money will be in Emily's account at the end of four years if it is compounded:

a.) Quarterly? a.) _____

b.) Monthly? b.) _____

c.) How long would it take Emily's money to triple if compounded continuously? c.) _____

40.) The number of people infected by the flu in a particular region after t hours is given by: $P(t) = 5e^{0.03t}$ where $t \geq 0$.

a.) Is this a growth or decay problem? a.) _____

b.) What is the initial population of people infected by the flu? b.) _____

c.) What is the population of people infected by the flu after 12 hours? c.) _____

d.) What is the population of people infected by the flu after 1 day? d.) _____

41.) The population of mosquitoes after t days is given by: $P(t) = 500e^{-0.055t}$ where $t \geq 0$.

a.) Is this a growth or decay problem? a.) _____

b.) What is the initial population of mosquitoes? b.) _____

c.) What is the population of mosquitoes after 1 day? c.) _____

d.) What is the population of mosquitoes after 72 hours? d.) _____

42.) The gross domestic product (GDP) of the United States has shown logistic growth from 1970 through 1992. The gross domestic product G (in billions of dollars) can be modeled by the equation $\boldsymbol{G = \frac{9200}{1+8.03e^{-0.121t}}}$ where t is the number of years since 1970.

a.) What was the value of the GDP in 1982? Round to the nearest dollar.

b.) In what year was the GDP approximately $50000 billion? Show all work.

43.) The first year you begin working you decide to open an IRA. You plan to contribute $250 each month to an account that has an APR of 6.8%.

a.) How much will you invest in 10 years?

b.) How much will the account be worth in 10 years?

c.) How much interest will you earn in 10 years?

44.) The Smiths have taken a 30-year mortgage on their house for $250,000 with an interest rate of 4.25% compounded monthly.

a.) What will the monthly payment (principle + interest) be?

b.) How much will the pay in interest over the life of the loan?

c.) How much will they pay for the home overall?

d.) Suppose they decide to up their monthly payment to $1,500 a month. How long (to the nearest full year) will it take them to pay back the loan?