

**Precalculus Unit 4: 4.1-4.3 Review**  
**Exponential and Logarithmic Functions**  
**(10 points)**

1. What is the base of a natural logarithm? What is the base of a common logarithm? (.5)

Natural log  $\Rightarrow$

Common log  $\Rightarrow$

2. Since 1950, the growth in world population in millions closely fits the exponential function defined by  $A(t) = 2600e^{0.018t}$  where  $t$  is the number of years since 1950. (1)

a. Use the function to approximate the population in 1990 (The actual population in 1990 was about 5,320 million).

b. Estimate the population in 2020.

3. \$1500 is invested at a rate of 8% compounded quarterly. What is the balance at the end of five years? (.5)

4. \$3500 is invested at a rate of 4.5% compounded continuously. What is the balance at the end of 15 years? (.5)

5. Evaluate the following logarithms without using a calculator: (2)

a.  $\log_5 \frac{1}{125}$

b.  $\log_{25} 5$

c.  $\log_8 8^{2x+1}$

d.  $\log_9 27$

e.  $\log_7 1$

f.  $\log_a \frac{1}{a}$

g.  $\ln e^{1-x}$

h.  $\log_a a^3$

6. Using the graph of  $y = 2^x$  as the base function, explain the transformations in the following graphs. (1)

a.  $y = 3 - 2^{x-1}$

b.  $y = 2^{-x} - 8$

7. Complete each of the following properties: (1)

a.  $\log_a x = \frac{\log x}{\log a}$

b.  $\log_a m - \log_a n =$

c.  $\log_a(m \cdot n) =$

d.  $r \log_a m =$

8. Write  $3^5 = 243$  in logarithmic form. (.5)

9. Write  $\log_3 81 = x$  in exponential form. (.5)

10. Evaluate  $\log_3 10$  using change of base. (.5)

11. Expand to a sum or difference of logarithms. (1)

a.  $\log \sqrt{\frac{a^2b}{c}}$

b.  $\log_b \frac{x^3w^3}{z\sqrt{y}}$

12. Simplify each expression into a single logarithmic quantity. (1)

a.  $\frac{1}{4}\log_b 16 - 2\log_b 5 + \log_b 7$

b.  $\frac{1}{2}\log_y(p^3q^4) - \frac{2}{3}\log_y(p^4q^3)$

