Calculator Inactive – Write your answers in the spaces provided. Present clear, concise solutions

1. Convert $3^{x-2} = 8$ into log form: **(1M)**

2. Convert $3\log_x 12 = \frac{1}{2}$ into exponential form: **(1M)**

3. Given the following equations, state whether the equation models exponential growth or exponential decay. Then from the equation, state what the growth rate or the decay rate is **(2M)**

(a) $y = 2500(1.05)^x$ _____.

(b) $y = 1750(0.81)^x$ _____.

4. Use the properties of logarithms to simplify or expand the following expressions (Do NOT evaluate the final expressions): **(7M)**

(a) $\log_5 4 + 3\log_5 2$ (b) $\log_6\left(3x^3y^{-2}\right)$ (c) $3\log a - 2\log b$

5. Evaluate the following logarithmic equations: **(10M)**

(a) $\log_2 8 + \log_7 \frac{1}{7}$ (b) $2\log_2 64 + \log_2 2$ (c) $\log_{\frac{1}{2}} 4 + \left(\frac{\log_4 256}{2\log\frac{1}{100}}\right)$

6. Solve the following equations. Show a complete algebraic solution. **(13M)**

(a) $\frac{1}{27} = 3^{2x}$

(b) $\log_x \frac{1}{64} = 3$

(c) $10 = 4^{1-x} + 2$

(d) $2\log_3 x = 4$

7. On the two grids provided below, first sketch a graph of $y = 2^x$ and then on the second graph, you will graph the transformed exponential graph $y = 4 - 2^{x+3}$. For the transformed function, determine the domain, range, asymptote, x- and y-intercepts. (HINT: It may help to identify the transformations first)

(7M)

Domain:	QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.
Range:	
x-intercept:	
y-intercept:	
Asymptote:	

8. Graph the function $\log_2(x-4)+3$. (HINT: Start with $\log_2 x$). State the domain, range, x- and y-intercepts, and the equation of the asymptote. (HINT: It may help to identify the transformations first)

(7M)

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Range:	
x-intercept:	
y-intercept:	
Asymptote:	

Calculator Active – Write your answers in the spaces provided. Present clear, concise solutions

1. A $32,000 car decreases in value at an annual rate of 12%. **(6M)**

(a) Write an equation to model how the value of the car changes over time.

(b) What will be the value of the car in 5 years? Show a complete algebraic solution.

(c) When will the value of the car be $12,000? Show a complete algebraic solution.

2. Mr. Santowski invests $20,000 into an account that earns interest at a rate of 10%/a, compounded monthly. **(6M)**

(a) Write an equation to model how the value of the investment changes over time.

(b) What will be the investment in 4 years? Show a complete algebraic solution.

(c) When will the value of the investment be $40,000? Show a complete algebraic solution.

3. The radioactive isotope carbon-14 is used to determine the approximate date of artifacts found at archaelogical sites. Carbon-14 has a half-life of 5370 years. If a sample of pottery found at a site has 23% carbon-14 remaining, determine the age of the pottery. Show a complete algebraic solution. **(4M)**

4. Mr Santowski invests some money in an investment that is compounded continuously at an interest rate of 7%. You long will it take to triple my investment? **(4M)**

5. The population of California was 33,000,000 in the year 2000 and has been growing at an annual rate of 1.3%. The population of Texas was 20 million in the year 2000 and has been growing at an annual rate of 2.1%. Will the population of Texas ever exceed that of California? If so, when? Explain your reasoning (either algebraic, graphic, numeric or elsewise) **(4M)**

6. The population of Cornwall (Mr. Santowski's home town) was 46,000 ten years ago (in 1998), but has changed to a current population of 40,769. Determine an equation in the form of $y = ab^x$ that models the population of Cornwall. Let x = 0 represent the year 1980. Show necessary algebraic work. **(5M)**

7. Solve the following exponential and logarithmic equations. Show complete algebraic solutions to earn full credit for your work. **(13M)**

(a) $4^{x+2} = 27$

(b) $\log_2 4x = 5$

(c) $\log_2(x+1) + \log_2(x-1) = 3$ (Verify solution)

(d) $3\ln x - \ln 2 = 4$

8. You are given that $\log_7 4 = 0.712,\ \log_7 5 = 0.827,\ \log_7 6 = 0.921$. Use this given information and the properties of the logarithms to evaluate the following expressions: **(6M)**

(a) $\log_7 \frac{1}{20}$ (b) $\log_7 80$ (c) $\log_7 \frac{216}{5}$

9. Solve the equation $e^{0.3x-e} + 1 = \ln\left[(4x+1)^2\right]$ for x graphically. Explain what you are looking for and what equation(s) you used. State your window settings. Include a rough sketch the graph (no points necessary, just give me a general idea of the graph)

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