Directions: You are allowed one 3"X 5" note card and a scientific calculator−no other electronics. Complete all your work on this paper. It is recommended you show all of your work to receive full credit. Please **box** your answers; if I can not find your answer, I can't give you points for it. If you finish the test before time is up, please review your work and make sure the work presented is 100% correct.
Note: If you do not have a calculator you need not simlify answers such as: $(1.12)^3-1, \log(25/12)$, or $(e^{.3}-1)$ any further. If you are unsure if an answer should be simplified feel free to ask.

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1. **(10 points)** Use the rules of logarithms to show that the following are equivalent:
   (a) $-4\log 3 + \log 3 = \log(\frac{1}{27})$
   (b) $\ln(\frac{16}{3x}) = 4\ln 2 - (\ln 3 + \ln x)$

2. **(15 points)** Solve for x (simplify all logs)
   (a) $3\log x = 5$
   (b) $2 \cdot 8^x = 4^{x+1}$
   (c) $-2\log 2 + \log x = -3$

3. **(10 points)** Create a function based on the given conditions with initial value, $P(0) = 100$.
   (a) The function increases by 12% each year.
   (b) The function decreases at a constant rate of 8 each year.

4. **(20 points)** Solve for t, (you do not need to simplify your answers)
   (a) $\ln t = 7 \ln 2 - 2 \ln 3$
   (b) $\ln t - \ln(t-1) = 1$
   (c) $e^{t^2} = 4$
   (d) $244 = 61 \cdot 5^t$

5. **(10 points)** Complete the following table.

	Initial Value	Growth or Decay	Factor	Rate	Equation
a)	84		2.32		
b)	98		0.82		
c)	111	Growth		29%	
d)	7	Decay		43%	

6. **(15 points)** Given the following equations state the initial amount, number of interest periods, nominal interest rate and effective interest rate.
   (a) $f(x) = 200 \cdot (1.05)^{5x}$
   (b) $g(t) = 2 \cdot e^{4x}$
   (c) $y = 18 \cdot (.57)^x$

7. **(10 points)** Kyle invested \$400 in Freeman Savings Bank at an interest rate of 8% per year. How many years would it take for the account to have more than \$600? (You do not need to simplify your answer, do not estimate.)

8. **(10 points)** A local credit union offers different savings accounts based off of the minimum account balance. With an initial balance of $\$25,000$ construct an equation for each of the following interest rates and compound periods.
   (a) 9%, compounded monthly
   (b) 11%, compounded continuously

Extra Credit **(15 points)** Generate a quick sketch of the following functions; besides the y-intercept you do not need to put specific values on your graph, just the x and y axes.

$$f(x) = t(7.2)^x, \quad g(x) = 5(0.6)^x$$
$$h(x) = 5 + 3x, \quad j(x) = 5(1.7)^x$$

(a) As $x \to +\infty$, which function(s) approach $+\infty$?
(b) As $x \to +\infty$, which function(s) approach 0?
(c) Are there any horizontal asymptotes?
(d) Which function increases the fastest and why?