City Semester Name:_____
Problem Set #5
Show all work for full credit.

1. Recall that to say that $y = \log_b x$ also implies that $b^y = x$. Evaluate the following expressions without a calculator.

   (a) $\log_2 64$

   (b) $\log_2 \frac{1}{32}$

   (c) $\log_2 \sqrt{8}$

   (d) $\log_2 \frac{\sqrt{32}}{\sqrt[3]{2}}$

   (e) $\ln e^2$

   (f) $\ln \sqrt[3]{e^4}$

   (g) $2 \log 10 + 3 \ln e^3$

2. Remember that the exponential $y = b^x$ is the inverse of the logarithm base b, in other words $b^{\log_b u} = u$ and $\log_b b^u = u$. Evaluate the following without a calculator.

   (a) $\log 10^{2x}$

   (b) $10^{\log 2x}$

   (c) $\log 10^{x^2+2x+1}$

   (d) $e^{3 \ln 5x}$

3. Use the idea of inverse functions to solve for x in the following equations.

   (a) $120 = 3(10)^x$

   (b) $120 = 3(10)^{x+3}$

   (c) $100 = \log(10x)$

   (d) $100 = \log(25x^2)$

   (e) $100 = 3e^{x+5}$

   (f) $100 = \ln(25x^3)$

4. Let $A(t) = 1000(1.03)^t$.

   (a) If the function A were supposed to model the amount of money A in terms of time t in years, give an explanation of the meaning of the numbers 1000 and 1.03 in the model.

   (b) How much money is there at time 0?

   (c) How long would it take to double the amount of money?

   (d) How long would it take to triple the amount of money?

   (e) How long would it take to have five times the original amount of money?

   (f) How long would it take to have n times the original amount of money?

5. Let $f(x) = \log_2(x-5)$ and $g(x) = \log(x+2) + 5$
   (a) Give the domain of f.
   (b) Give the domain of g.
   (c) Give the range of f.
   (d) Give the range of g.
   (e) On the same axes give a sketch of both f and g including their vertical asymptotes.
6. Explain why the magnitude of earthquakes is measured on a logarithmic scale.
7. What other phenomena are measured on a logarithmic scale?