**Math 12** **Name (Print):** ____________________

**Fall 2016 - Exam 2: Chapter 4 - 10/13/16 - Write all responses on separate paper. Show your work for credit.**

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1. Solve each equation for $x$. You won't need a calculator.
   (a) $2 = \log_5(x^2 + 3x - 3)$
   (b) $4^{-0.5x} = \dfrac{1}{8}$
2. For each function,
   - find the vertical asymptote(s),
   - find the $x$ and $y-$intercepts,
   - construct a table of values including two other points and
   - construct a graph showing these features:

   (a) $f(t) = \ln(3t + e)$
   (b) $g(x) = \log_{10}(10 - x^2)$
3. Solve the equation for $x$ in an exact, simplified form, then approximate the value(s) to the nearest ten thousandth.
   (a) $2^{10} = 100^x$
   (b) $\left(1 + \dfrac{1}{8}\right)^3 = e^{2x}$
4. Use the properties of logarithms to solve each equation
   (a) $\log_5(3x - 2) + \log_5(x - 8) = 2$
   (b) $\log_2(x^2 + 1) = 1 + \log_2(x + 2)$
5. Suppose that \$1,000 is invested in a savings account paying 3.2% interest per year..
   (a) Write the formula for the amount in the account after $t$ years if interest is compounded monthly.
   (b) How much more would the value of the investment increase if it was compounded continuously?
6. The Richter magnitude of an earthquake is defined to be $M = \log \dfrac{I}{S}$ where $I$ is the intensity of the earthquake and $S$ is the intensity of a "standard" earthquake. An earthquake measuring 9.0 on the Richter scale struck Japan in March 2011, causing extensive damage. How many times more intense was the Japanese earth-quake than a minor earthquake measuring 4.3 on the Richter scale?
   *Hint:* If $I_0$ is the intensity of the Japanes earthquake and $I_1$ is the intensity of the Salton Sea quake, we want to compute $\frac{I_0}{I_1}$.
7. Postassium-40 ($^{40}$K) is a radioactive isotope of potassium which has a very long half-life of $1.251 \times 10^9$ years. At time $t = 0$ a heavy canister contains 3 grams of Potassium-40.
   (a) Find a function $m(t) = m_0 2^{-t/h}$ that models the amount of $^{40}$K left in the canister after $t$ years.
   (b) Find a function $m(t) = m_0 e^{-rt}$ that models the amount of $^{40}$K remaining after $t$ seconds.

   (c) How much $^{40}$K remains after 1 billion years?

   (d) After how long will the amount of $^{40}$K be reduced to 1 mg$= 10^{-6}$ grams?