Exam 3 Study Guide :: Math 115 :: Winter 2015

1. **Exponential Functions**
   How long will it take for an investment of \$1000 to double in value if the interest rate is 6.5%, compounded quarterly?

2. **Exponential Decay**
   A funny looking seashell was found in Lake Superior, and the NMU chemistry lab found that it contains 72% of the carbon-14 that is present in living seashells. Given that the half-life of carbon-14 is 5730 years, estimate the age of the seashell.

3. **Logarithmic Models**
   On Tuesday of this week yet another earthquake occured in Oklahoma, this time of magnitude 4.0. In 2011, an earthquake of magnitude 9.0 occured off the coast of Japan, triggering a devastating tsunami. How many times more intense was the 2011 earthquake near Japan than this week's earthquake in Oklahoma.

4. **Algebra of Logarithmic and Exponential Functions**

   Simplify $\ln(e(x^2+1))$

   Simplify $\ln(x-1) - 3\ln(x+1) + \ln(e^x+1)$

   Solve $\log(x+1) - \log(x-1) = 2$

   Solve $\ln(x^2 - 5x - 23) = 0$

5. What is the relationship between

$$\left(1+\frac{1}{n}\right)^n$$

   and the natural number e?

6. **Polynomial and Rational Functions**
   Find all the rational zeros of $f(x) = x^4 - 5x^3 + 6x^2 + 4x - 8$.

7. **Complex Numbers**
   Evaluate and write in the form $a + bi$ the following
   (a)
   $$\frac{1}{1+i}$$
   (b)
   $$(1+2i)(3-4i)$$
   (c)
   $$(2+3i)(2-3i)$$
   (d)
   $$i^{203}$$

8. **Graphing and Interpreting Rational Functions**
   Sketch a graph, determine all asymptotes, and all zeros of (a)
   $$f(x) = \frac{1}{x}$$

   (b)
   $$g(x) = \frac{x+1}{x-1}$$

   (c)
   $$h(x) = \frac{5x+10}{x^2-7x+12}$$

   (d)
   $$k(x) = \frac{x^2-4x-5}{x^2-6x-16}$$