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### **Test 3** Fall 2008 MATH 111 Section 01 March 19, 2008

**Directions :** You have 50 minutes to complete all 5 problems on this exam. There are a possible 100 points to be earned. You may not use your book, notes, or any graphing/programmable calculator. Please be sure to show all pertinent work. An incorrect answer with no work will receive no credit! If any portion of the exam is unclear please come to me and I will elaborate provided I can do so without giving away the problem.

### 1. (20 points)

Suppose that given an initial amount  $q_0$  of a radioactive material it is known that the amount remaining after t years is given by the equation

$$q(t) = q_0 5^{rt}$$

where r is the rate of decay. Given that after 200 years there is exactly one twenty fifth of the initial amount remaining, find the rate of decay.

## 2. (20 points)

Find the inverse function of

$$f(x) = \frac{3x+2}{2x-5}.$$

## 3. (20 points)

Use the theorem of inverse functions to show that the two functions

$$f(x) = \frac{4x}{x-2}$$
 and  $g(x) = \frac{2x}{x-4}$ 

are inverses of one another. You must use the theorem of inverse functions, do **not** compute the inverse of f(x) and show that it is g(x) or vice versa.

4. (20 points) Solve the equation

$$9^{2x} \cdot \left(\frac{1}{3}\right)^{x+2} = 27 \cdot (3^x)^{-2}.$$

# 5. (20 points)

Solve the following equations:

(a) 
$$e^{2\ln(x)} = 9$$
 (b)  $\log_7(x-5) = \log_7(6x)$