

12-12:50pm

Midterm Exam 2

Fall 2012

Math 0220

100 points total

Your name: _____

No calculators, no notes, no books. Show all your work (no work = no credit). Write neatly. Simplify your answers.

1. [10 points] Find a formula for the inverse of the function $f(x) = \frac{2x + 3}{4x - 1}$.

2. [15 points] Use logarithmic differentiation to find y' if $y = x^{\sin x}$.

3. [15 points] The half-life of cesium-137 is 30 years. If you have a 200-mg sample after how long will only 30 mg remains? Simplify your answer.

4. [15 points] Find the limit. Use l'Hospital rule if appropriate.

$$\lim_{x \rightarrow 0^+} (2x)^x.$$

5. [15 points] Find the absolute maximum and the absolute minimum values of the function

$$f(x) = \frac{x}{x^2 + 1} \text{ on the interval } [0, 3].$$

6. [15 points] Find two positive numbers whose product is 4 and whose sum of their squares is as small as possible. For a proof use the optimization method.

7. [15 points] Use Newton's method to approximate the number $\sqrt[3]{10}$. Use $x_1 = 2$ as an initial approximation and find the second approximation x_2 to the number.

bonus problem [10 points extra] Show that the equation $2 \cos x - 5x = 1$ has exactly one real root.