Loyola University Chicago
Math 161, Fall 2010

Midterm 2 Sample

Name (print): _____ **Signature:** _____

Please do not start working until instructed to do so.

You have 75 minutes.

You must show your work to receive full credit.

No calculators.

You may use one double-sided 8.5 by 11 sheet of handwritten (by you) notes.

Problem 1. _____

Problem 2. _____

Problem 3. _____

Problem 4. _____

Problem 5. _____

Total. _____

Problem 1. *(20 points)* Find the following limits and integrals. Put a box around your final answer.

a. *(4 points)* $\lim_{x\to\infty} \dfrac{\ln(2x+4)}{7x+11}$

b. *(4 points)* $\lim_{x\to\infty} \left(1+\dfrac{4}{x}\right)^{3x}$

c. *(4 points)* $\lim_{x\to 0} \dfrac{\tan(\pi x)}{\ln(1+x)}$

d. *(4 points)* $\displaystyle\int 3x^5 - 2x + 1\, dx$

e. *(4 points)* $\displaystyle\int e^{-4x} + \frac{3}{1+x^2}\, dx$

Problem 2. *(10 points)* Use Newton's method to approximate the value of $\sqrt{12}$. Pick the initial approximation x_1 reasonably. Then find the second approximation x_2 and the third approximation x_3. You do not need to simplify the second approximation.

Problem 3. *(10 points)* Find horizontal and vertical asymptotes (if any exist), critical points (if any exist), and classify the critical points as local/global minima/maxima/neither, for the function

$$f(x) = \frac{e^x}{1+x^2}$$

Problem 4. *(10 points)* You are designing a rectangular poster to contain 50 square inches of printing with a 4 inch margin at the top and bottom and a 2 inch margin at each side. What overall dimensions will minimize the amount of paper used?

Problem 5. *(10 points)* Suppose that an ostrich 5 ft tall is walking at a speed of 4 ft/sec directly towards a light 10 ft high. How fast is the tip of the ostrich's shadow moving along the ground?