MAT430 Exam 2 (Spring 2010)

Name:

Directions: Show your work! Answers without justification will likely result in few points. Your written work also allows me the option of giving you partial credit in the event of an incorrect final answer (but good reasoning). Indicate clearly your answer to each problem (e.g., put a box around it). **Good luck!**

a. **In-Class Portion:** Choose 5 of the following 6 problems to try. Each should be on a separate page. You need only write the problem number at the top of the page.

Problem 1. (10 pts) Demonstrate that the function

$$f(z) = e^{z+1}$$

is entire in two different ways.

Problem 2. (10 pts) Use Euler's formula to derive the formula for $\sin(z)$ in terms of e^{iz} and e^{-iz}.

Problem 3. (10 pts) Find the real and imaginary parts of $(1+i)^i$.

Problem 4. (10 pts) For which values (if any) is $\text{Log}(e^z) = z$? Justify your answer.

Problem 5. (10 pts) Demonstrate that $f(z) = \frac{1}{r}(\cos(\theta) - i\sin(\theta)$ is analytic on a portion of the complex plane (to be determined).

Problem 6. (10 pts) Show that $u(x, y) = \cos(x)\sinh(y)$ is harmonic on the entire plane. Then find a harmonic conjugate of u, and so define an entire function.

b. "Take-Home" portion: To encourage you to practice your inverse trig functions, I'd like you to do exercises p. 110, #1ab, 2-6 for your "take-home" component. You are to work alone, and not use the web, student solutions manual, etc. You may use your book, of course!