

**Math 1b Section 2 Midterm #1, 2/14/06, 3:40 PM – 5:00 PM**

Each of the 6 questions is worth 10 points. Please write your solution to each of the 6 questions on a separate sheet of paper with your **name, GSI, and SID#** on it. To get full credit, put a box around your final answer and show your work. No notes or calculators are allowed. Please hand in your exam to your GSI. Good luck!

1. Evaluate the definite integral

$$\int_{\ln 3}^{\ln 8} \frac{dx}{\sqrt{e^x + 1}}.$$

2. Find the area of the surface obtained by rotating the quarter-circle

$$y = 2 + \sqrt{1 - x^2}, \quad \frac{-1}{\sqrt{2}} \leq x \leq \frac{1}{\sqrt{2}}$$

around the  $x$ -axis.

3. Suppose we want to approximate the definite integral

$$\int_2^6 \frac{dx}{x}.$$

- (a) Calculate the midpoint approximation explicitly when  $n = 2$ .  
(b) Find a value of  $n$  such that the error in the midpoint approximation is at most  $1/100$ . You must justify your answer to receive credit.

4. Evaluate the following improper integral if it is convergent; otherwise show that it is divergent.

$$\int_2^{\infty} \frac{dx}{x(x-1)}.$$

*Hint:* remember that  $\ln(a) - \ln(b) = \ln(a/b)$ .

5. Evaluate the indefinite integral

$$\int x^2 \arctan x \, dx.$$

6. Evaluate the following improper integral if it is convergent; otherwise show that it is divergent.

$$\int_0^1 \frac{x + e^x}{x^{3/2}} \, dx.$$