# Math 1B Midterm 1

Slobodan Simić, Spring 2012

February 13, 2012

**GSI** (circle one): Aditya Adiredja, Shuchao Bi, Boaz Haberman,

Weihua Liu, Peter Mannisto, Rene Quilodran, Zvi Rosen,

Eugenia Rosu, Per Stinchcombe, Zack Sylvan, Michael Wan

|  | Score |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| Total | |

**Instructions.** Read the problems very carefully to be sure you understand the statements. Justify your answers. Show all your work as clearly as possible and $\boxed{circle}$ the final answer to each problem. When giving explanations, write complete sentences. If you have any questions, please ask any of the proctors. When you are done with the exam, please hand it to your GSI. If you finish early, please leave quietly.

1. **(20 points)** Compute the following integral:

$$\int_0^{\sqrt{3}/2} \arcsin x \, dx.$$

**2. (20 points)** Compute the following two integrals:

(a)
$$\int x \arctan x \, dx.$$

(b)
$$\int_0^{1/\sqrt{2}} \frac{dx}{(1 - x^2)^{3/2}}.$$

**3. (20 points)** Compute the following integral:

$$\int_0^{\pi/2} \sin^5 x \, dx.$$

**4. (20 points)** Determine whether the following integrals converge or diverge. If an integral converges, compute its value.

(a)
$$\int_e^\infty \frac{dx}{x(\ln x)^2}.$$

(b)
$$\int_2^\infty \frac{x^2 + 1}{\sqrt{x^6 - x^4}}dx.$$

**5. (20 points)** Find the arc length of the curve defined by

$$y = \ln(1 - x^2), \qquad 0 \le x \le \frac{1}{2}.$$