

Name: \_\_\_\_\_ ID#: \_\_\_\_\_

## Midterm III

Math 1a  
Introduction to Calculus

May 6, 2005

Show all of your work. Full credit may not be given for an answer alone. You may use the backs of the pages or the extra pages for scratch work. Do not unstaple or remove pages.

Problems are numbered with arabic numerals (1, 2, 3, ...) and may stretch across several pages. Parts of problems are enumerated with either letters ((a), (b), (c), ...) or small roman numerals ((i), (ii), (iii), ...).

**This is a non-calculator exam.**

*Students who, for whatever reason, submit work not their own will ordinarily be required to withdraw from the College.*

*—Handbook for Students*

Problem Number	Possible Points	Points Earned
1	20	
2	15	
3	15	
4	10	
Total	60	

**1****1**

1. (20 Points) Compute the following integrals. For definite integrals, your answer should be a number. For indefinite integrals, your answer should be the most general antiderivative as a function of  $x$ .

(i)  $\int x^{3/2} dx$ .

(ii)  $\int_{-3}^5 \left(5 - \frac{x}{2}\right) dx$

**1****1**

(iii)  $\int x^3(x^4 - 1)^2 dx$

(iv)  $\int_{2\pi}^{3\pi} 3 \cos^2 x \sin x dx.$

**2**

**2**

**2.** (15 Points) Find the total area of the region bounded by the curve  $y = x^3 - 4x$  and the  $x$ -axis between  $-2$  and  $2$ .

**3**

**3**

**3.** (15 Points) The police observe that the skid marks made by a stopping car are 250 feet long. Assuming the car decelerated at a constant rate of  $20 \frac{\text{feet}}{\text{sec}^2}$ , skidding all the way, how fast was the car traveling when the brakes were initially applied?

4. (10 Points) Let  $f$  be the function

$$f(x) = x \int_0^x \frac{\sin t}{t} dt.$$

(The integrand is continuous at 0 since

$$\lim_{t \rightarrow 0} \frac{\sin t}{t} = 1;$$

you might need that fact later).

(a) Show  $f'(0) = 0$ .

(b) It's not immediately clear what  $f''(0)$  is. Find the limit:

$$f''(0) = \lim_{x \rightarrow 0} \frac{f'(x)}{x} = ?$$

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