

## Calculus 2 (Math 232) Final Exam

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Date: Dec 18, 2007

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1. Justify answers and show all work for full credit.
2. No *graphing* calculators allowed on this exam.
3. Answer the questions in the space provided on the question sheet. If you run out of room for an answer, continue on back of the page.

NAME: \_\_\_\_\_

1. \_\_\_\_\_

2. \_\_\_\_\_

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7. \_\_\_\_\_

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**Problem 1.** (10 pts.) Find the volume of the solid generated by revolving about the  $x$  axis the region bounded by the line  $y = 6x$  and the parabola  $y = 6x^2$ .



**Problem 2.** (10 pts.)

(a) Evaluate the improper integral

$$\int_2^{\infty} \frac{1}{x \ln^3 x} dx.$$

(b) Does the series

$$\sum_{n=2}^{\infty} \frac{1}{n \ln^3 n}$$

converge or diverge? Why?

**Problem 3.** (20 pts.) Examine the convergence of the following series. Justify your answers and explain what convergence criterium you used!

1.  $\sum_{n=1}^{\infty} (1 + 1/n)^n$

2.  $\sum_{n=1}^{\infty} \frac{5^n}{n!}$

3.  $\sum_{n=1}^{\infty} \frac{1}{n^2 + n + 1}$

4.  $\sum_{n=1}^{\infty} (-1)^n \tan(1/n)$

Problem 4. (10 pts.)

Find the integral  $\int \frac{x^2 + x + 1}{x(x^2 + 1)} dx$



**Problem 5.** (20 pts.) Find the integrals

(a)

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

(b)

$$\int x \ln x \, dx.$$

**Problem 6.** (15 pts.)

(a) Find the Maclaurin series (Taylor series where  $c = 0$ ) for the function

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

[Hint: Note that  $d/dx[1/(1-x)] = f(x)$ . Find the Maclaurin series for  $1/(1-x)$ , and differentiate.]

(b) Find the interval of convergence of the series in (a).

**Problem 7.** (15 pts.)

Find the interval of convergence for the power series  $\sum_{n=1}^{\infty} \frac{(-2)^n}{n} (x-3)^n$ .