

**MATH106A CALCULUS II - PROF. P. WONG**

FINAL EXAM - APRIL 11, 2007

**NAME:**

Instruction: Read each question carefully. Explain **ALL** your work and give reasons to support your answers.

*Advice:* DON'T spend too much time on a single problem.

<b>Problems</b>	<b>Maximum Score</b>	<b>Your Score</b>
1.	18	
2.	18	
3.	14	
4.	17	
5.	21	
6.	16	
7.	21	
<b>Total</b>	125	

1. Evaluate each of the following indefinite integrals.

(9 pts.)(a)

$$\int \frac{\sec^2 z}{\tan z} dz$$

(9 pts.)(b)

$$\int \frac{x^3}{x^2 - 1} dx.$$

2. (9 pts.)(a) Find the indefinite integral

$$\int_1^e \sqrt{x} \ln x \, dx$$

- (9 pts.)(b) Evaluate the following improper integral.

$$\int_0^1 \frac{\theta + 1}{\sqrt{\theta^2 + 2\theta}} \, d\theta$$

**3.** Consider the following Initial Value Problem.

$$y' = xe^{-y}, \quad y(1) = 0.$$

(8 pts.)(a) Use the method of separation of variables to solve this IVP.

(6 pts.)(b) Estimate the value  $y(2)$  (when  $x = 2$ ) of the solution using Euler's method with two steps with initial point  $(1, 0)$ . DO THIS BY HAND.

(17 pts.)**4.** Find the volume of the solid formed when the region bounded by the curves  $y = \arctan x$ ,  $y = 0$ , and  $x = 1$  is revolved around the  $y$ -axis.  
[First sketch a picture of the region.]

5. Determine whether each of the following series converges or diverges. Justify your answer.

(7 pts.)(a)

$$\sum_{n=0}^{\infty} \frac{3^{n+1}}{5^n}$$

(7 pts.)(b)

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

(7 pts.)(c)

$$\sum_{n=1}^{\infty} \frac{n(n-1)}{2n^2 + n + 5}$$

6. For each of the following series, determine whether the series converges absolutely, conditionally, or neither.

(8 pts.)(a)

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{2n-1}$$

(8 pts.)(b)

$$\sum_{n=0}^{\infty} \frac{(-1)^n e^n n!}{(2n)!}$$

**7.**

(7 pts.)(a) Let  $f(x) = e^{\sin x}$ . Find the second degree Maclaurin polynomial for  $f(x)$ .

(7 pts.)(b) Find the Maclaurin series for  $h(t) = \frac{1}{1+t^3}$ .

(7 pts.)(c) For what values of  $x$  is the following power series convergent?  
[Don't forget to check the endpoints.]

$$\sum_{n=0}^{\infty} \frac{(-1)^n x^n}{n3^{n+1}}$$