

MATH106A,B CALCULUS II - PROF. P. WONG

EXAM II - MARCH 7, 2008

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.

Problems	Maximum Score	Your Score
1.	20	
2.	20	
3.	20	
4.	20	
5.	20	
Total	100	

1.(10 pts.)(a) Evaluate the indefinite integral

$$\int x^2 \ln(2x) dx.$$

(10 pts.)(b) Evaluate the indefinite integral

$$\int \frac{x^3 + 3}{(x + 1)x} dx.$$

2.(10 pts.) Find the indefinite integral

$$\int \frac{1}{x^2\sqrt{1+x^2}} dx.$$

(10 pts.)(b) Find the indefinite integral

$$\int \frac{1}{4x^2 + 4x + 10} dx.$$

3. (10 pts.)(a) Let $f(x) = \arctan x$. Write down the third-degree Maclaurin polynomial $M_3(x)$ for f .

(10 pts.)(b) Let $g(x) = \sqrt{x}$. Find the third-degree Taylor polynomial $P_3(x)$ for $g(x)$ centered at $x_0 = 4$.

4.(10 pts.)(a) Let $f(x) = \cos(2x)$. What is the maximum possible error, according to Taylor's theorem, committed by using the third-degree Maclaurin polynomial $M_3(x)$ to estimate $f(x)$ for $-2 \leq x \leq 2$?

(10 pts.)(b) Let

$$h(x) = \begin{cases} k \sin x, & \text{if } 0 \leq x \leq \pi; \\ 0, & \text{otherwise.} \end{cases}$$

Find k for which $h(x)$ is a probability density function.

5. Determine whether each of the following improper integrals converges or diverges. Justify your answers.

(10 pts.)(a)

$$\int_0^{\infty} \frac{1}{\sqrt{1+x^4}} dx$$

[Hint: compare this integral with another improper integral]

(10 pts.)(b)

$$\int_0^1 \frac{1}{\sqrt{1-x}} dx$$