

MATH106A,B CALCULUS II - PROF. P. WONG

EXAM II - MARCH 13, 2009

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

$$\int \frac{x^3}{4+x^2} dx.$$

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

$$\int \frac{x^2 + 3x + 1}{x(x^2 + 1)} dx.$$

2.(10 pts.) Find the **exact** value of the definite integral

$$\int_0^1 \arctan x \, dx.$$

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

$$\int \frac{1}{\sqrt{4x - x^2 + 5}} \, dx.$$

3. (10 pts.)(a) Let $f(x) = xe^{-x}$. Write down the third-degree Maclaurin polynomial $M_3(x)$ for f .

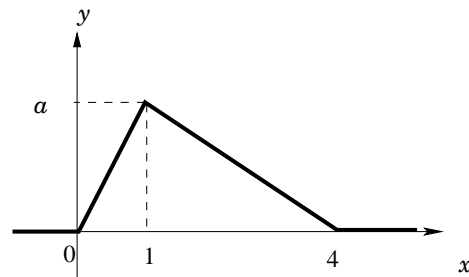
(10 pts.)(b) Let $g(x) = \ln x$. Find the fourth-degree Taylor polynomial $P_4(x)$ for $g(x)$ centered at $x_0 = 1$.

4.(10 pts.)(a) Let $f(x) = \sin(2x)$. 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 $-\frac{1}{2} \leq x \leq \frac{1}{2}$?

(10 pts.)(b) Let

$$f(x) = \begin{cases} \text{see graph below,} & \text{if } 0 \leq x \leq 4; \\ 0, & \text{otherwise.} \end{cases}$$

Find a for which $f(x)$ is a probability density function. Justify your answer.



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

(10 pts.)(a)

$$\int_e^{\infty} \frac{1}{x(\ln x)^2} dx$$

(10 pts.)(b)

$$\int_2^{\infty} \frac{x}{\sqrt{x^3 - 2}} dx$$