

MATH106A CALCULUS II - PROF. P. WONG

EXAM II - MARCH 13, 2015

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. Evaluate each of the following indefinite integrals (be sure to indicate what techniques you use).

(10 pts.)(a)

$$\int \cos^2 x \sin x \, dx.$$

(10 pts.)(b)

$$\int x \cos(3x) \, dx.$$

2. Evaluate each of the following indefinite integrals (be sure to indicate what techniques you use).

(10 pts.)(a)

$$\int \frac{x^3 + 1}{x^2 - 4} dx.$$

(10 pts.)(b)

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

3. Evaluate each of the following improper integrals.

(10 pts.)(a)

$$\int_0^{\infty} \frac{x \, dx}{(x^2 + 1)^2}$$

(10 pts.)(b)

$$\int_0^2 \frac{dx}{(x - 1)^{2/3}}$$

4. Let $f(x) = \frac{1}{2x-1}$.

(8 pts.)(a) Find the third-order Taylor polynomial $P_3(x)$ of $f(x)$ centered at $x_0 = 1$.

(6 pts.)(b) Find the third-order Maclaurin polynomial $M_3(x)$ of $f(x)$.

(6 pts.)(c) What is the maximum error committed by using $M_3(x)$ (as in part (b)) over the interval $[1, 2]$, according to Taylor's Theorem? [Hint: how do you obtain K_4 ?]

5. (12 pts.)(a) Use comparison to determine whether the following improper integral converges or diverges. Justify your answer.

$$\int_4^{\infty} \frac{1}{x^2 \ln x} dx$$

(8 pts.)(b) Consider the following function

$$f(x) = \begin{cases} \frac{C}{(x+1)^3}, & \text{for } x \geq 0; \\ 0, & \text{otherwise.} \end{cases}$$

For what value of C is $f(x)$ a *probability density function*?