

King Fahd University of Petroleum and Minerals  
 Department of Mathematical Sciences  
**Math 102 (Calculus II)**  
**Final Examination**  
**Semester II, 2004–2005(042)**  
**June 08, 2005**  
**Time: 07:30 am. – 10:30 a.m.**

Name: \_\_\_\_\_ Section #: \_\_\_\_\_

ID #: \_\_\_\_\_ Serial #: \_\_\_\_\_

Sec. #	Instructor	Location
04, 08	Dr. Abdul Rahim Khan	Multi-purpose Hall

**Instructions:**

1. Use of graphic calculators is not allowed.
2. show complete work for full credit.
3. This exam consists of 13 pages.

Question #	Grade/Points
1	_____/18
2	_____/18
3	_____/18
4	_____/18
5	_____/20
6	_____/18
Total:	_____/110

1. (a) Use the left endpoints in rectangle method to find the area under the curve  $y = 4 - \frac{1}{4}x^2$  over the interval  $[0, 3]$ . (9 points)

- (b) Determine whether the value of the integral  $\int_{-2}^1 \frac{x^5 - 3}{|x| + 2} dx$  is positive or negative. Give reasons to support your answer. (5 points)

- (c) Find  $\frac{d}{dx} \left[ \int_{3x}^{x^2} \frac{t - 1}{t^2 + 1} dt \right]$ . (4 points)

2. (a) Find the total area between the curves  $y = \sin x$  and  $y = \cos x$  from  $x = 0$  to  $x = 2\pi$ . (9 points)

- (b) The region bounded by the graphs of the equations  $x + y = 3$ ,  $y + x^2 = 3$  is revolved about the line  $x = 2$ . Set up an integral (do not evaluate it) to find volume of the solid generated. (9 points)

(i) by washers method

(ii) by cylindrical shell method.

3. (a) Find the arc length of the curve  $y = x^{3/2}$  from  $(1, 1)$  to  $(2, 2\sqrt{2})$ . (5 points)

(b) Evaluate  $\int \frac{dx}{x^2\sqrt{x^2 - 25}}$ . (4 points)

(c) Evaluate  $\int \frac{x+5}{9x^2+6x+17} dx$ .

(9 points)

4. (a) Determine whether the integral  $\int_3^{\infty} \frac{8}{x^2 - 4} dx$  converges or diverges. If it converges, then find its value. (9 points)



(b) Compute the integral or show its divergence  $\int_0^2 \frac{\cosh x}{(x-2)^2} dx$ . (5 points)

(c) Let  $f(x) = xe^x$ . Find the four terms of the Taylor's polynomial for  $f(x)$  at the point  $c = -1$ . (4 points)

5. (a) Find sum of the series  $\sum_{n=1}^{\infty} \left[ \frac{-3}{n(n+1)} + \frac{1}{4^n} - \frac{5}{n^4} \right]$ . (10 points)

(b) Check whether the series converges absolutely or diverges. (10 points)

(i) 
$$\sum_{n=2}^{\infty} (-1)^n \frac{1}{\sqrt{n}(\ln n)^3}.$$

(ii) 
$$\sum_{n=1}^{\infty} (-1)^n \frac{2^n}{n^3}.$$

6. (a) Find the radius of convergence and interval of convergence of the series

$$\sum_{k=1}^{\infty} (-1)^{k+1} \frac{(x+1)^k}{k}. \quad (9 \text{ points})$$

(b) Find a power series representation for  $f(x) = x^4 \cosh(-2x)$ . (4 points)

(c) Approximate  $\int_0^1 x \cos(x^3) dx$  to four decimal place accuracy. (5 points)