United Arab Emirates University
Department of Mathematical Sciences
Final Exam, Calculus II (Math 110)
Saturday, June 5th, 2010

Name: **Student Number**:

Please select your section, check ($\checkmark$) the box which corresponds to your section.

Your section	Section	Instructor
	01	Dr. Naim Markos
	010(IT)	Dr. Ahmed Makki
	51	Dr. Ahmed Al-Rawashdeh
	52	Dr. Simon Cowell
	53	Dr. Qasem Al Mdallal
	55	Dr. Hani Siyyam
	56	Dr. Naim Markos
	57	Dr. Naim Markos

Important Instructions:

- Graphing calculators, books or notes are NOT allowed.

- The exam consists of 10 essay questions. Read the questions carefully! and then write justified answers in the spaces provided below each question.

- The exam is written in 9 pages including this front page. The duration of the exam is two hours

Question	01	02	03	04	05	06	07	08	09	10	Total
Course Outcome	1	8	5	6,7	7	2	6,7	3	4	7	——
Mark											
Out of	4	6	5	4	4	5	5	5	3	4	40

[Question 01, 2+2 pts] Evaluate the following integrals:
(a) $\int x \sin(3x)dx$

(b) $\int \sec^5 x \tan x \ dx$

[Question 02, 2+2+2 pts] (a) Use Taylor series of $\sin x$ in powers of x to find Taylor series of $\sin x^2$ in powers of x.

(b) Find a Taylor polynomial of degree 10 which approximates $\sin x^2$

(c) Use the polynomial in (b) to approximate $\int_0^1 \sin x^2 dx$.

[Question 03, 1+4 pts] Given the polar curves
$r = 1 - \sin\theta; \ 0 \leq \theta \leq 2\pi$ and $r = \sin\theta; \ 0 \leq \theta \leq \pi$.
(a) Find the intersection point(s) between the curves.

(b) Find the area of the region which lies inside both curves. First
sketch the required region.

[Question 04, 2+2 pts] Determine convergence or divergence of the following series

(a) $\sum_{k=0}^{\infty} \frac{5k+1}{3k+5}$

(b) $\sum_{k=1}^{\infty} \frac{\cos k + 2}{k^2}$ (Hint: Use comparison test)

[Question 05, 4 pts] Find the interval of convergence of the series

$$\sum_{k=0}^{\infty} \frac{(-1)^k x^k}{3^k(k+1)}$$

[Question 06, 3+2 pts] (a) Show that the improper integral is convergent $\int_1^\infty \frac{e^{-\sqrt{x}}}{\sqrt{x}}dx$.

(b) Show that the series is convergent

$$\sum_{k=1}^\infty \frac{e^{-\sqrt{k}}}{\sqrt{k}}$$

[Question 07, 2+3 pts] **(a) Determine convergence or divergence of the series $\sum_{k=1}^{\infty} \frac{k}{k^2+1}$**

(b) Determine if the series is absolutely convergent, conditionally convergent or divergent $\sum_{k=1}^{\infty}(-1)^{k+1}\frac{k}{k^2+1}$

[Question 08, 2+3 pts] Let C be the portion of the parabola
$y = x^2 - 4; \ 2 \le x \le 4$**.**
(a) Find parametric equations $x(t), y(t)$ and a domain for t which parametrize C.

(b) Find the area of the surface obtained by revolving the curve C about the y-axis.

[Question 09, 3 pts] Find the slope of the tangent line to the curve
$r = e^{\theta}; \ 0 \le \theta \le 2\pi$ **when** $\theta = \pi$**.**

[Question 10, 2+2 pts] Find the sums of the following series:

(a) $\sum_{k=0}^{\infty} e^{-k} - e^{-(k+1)}$

(b) $0.1 + 0.01 + 0.001 + 0.0001 + 0.00001 + \cdots$

GOOD LUCK