Prince Sultan University

Department of Mathematical Sciences

Final Exam

Semester II, 2007 SPRING (062)

13th June, 2007

MATH 113 – CALCULUS II

Time Allowed : 120 minutes **Mr. Khaled Naseralla**

Maximum Points: 100 points

Name of the student : _____

ID number : _____

Section : _____

For All The Students:

- **Answer all the questions.**
- **This exam consists of *9 questions and a total of 8 pages.***
- **Show your working for each question with all the key steps.**
- **Only scientific, non-programmable calculators are allowed.**

Questions	*Maximum Score*	*Your Score*
Q.1	30	
Q.2	10	
Q.3	10	
Q.4	6	
Q.5	10	
Q.6	10	
Q.7	6	
Q.8	8	
Q.9	10	
Total	100	

***Q.1** (5 points each) :* **Evaluate the following integrals:**

a) $\int x^3 \ln x dx$

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

c) $\int_0^{\frac{\pi}{3}} \frac{\sin^3 x}{\cos x} dx$

d) $\int x\tan^{-1}(x)dx$

e) $\int \frac{x}{\sqrt{1-x^4}}dx$

f) $\int_1^{\sqrt{2}} x^3\sqrt{x^2-1}dx$

Q.2 *(5 points each):* **Determine the divergence or convergence of the improper integral. If it converges, find its value.**

a) $\int_0^{\infty} xe^{-\frac{x^2}{2}}dx$

b) $\int_{-\infty}^{+\infty} \frac{1}{1+x^2}dx$

Q.3 *(5 points each):* **Evaluate the following:(Show all your steps)**

a) $\sum_{k=4}^{50}(3k-2)$

b) $\lim_{n\to+\infty}\sum_{k=1}^{n}\frac{1}{n}\left[\frac{k^2}{n^2}+\frac{2k}{n}\right]$

***Q.4** (6 points):* **Find the volume of the solid generated when the region enclosed by the curves** $x=y^2$ **and** $x=4$ **is revolved about the line** $y=-3$

Q.5 *(5 points each):* **Find the following limits:**

a) $\lim_{x \to \infty} (x^2 e^{-3x})$

b) $\lim_{x \to 0} \left(\frac{1}{x^2} - \frac{\cos 3x}{x^2} \right)$

Q.6*(5 points each):* **Use** $n = 4$ **to approximate the integral** $\int_{-1}^{1} (2x + x^2) dx$ **by:**

a) the trapezoid approximation

b) Simpson's rule

***Q.7** (6 points):* **A particle moves along an $S-axis$. Use the given information to find the position function, $S(t)$ of the particle.**

$$a(t)=4\cos 2t \;\; ; \;\; v(0)=-1 \;\; ; \;\; S(0)=-3$$

***Q.8** (8 points):* **a) Use the second Fundamental Theorem of Calculus to find $F'(x)$ given that**

$$F(x)=\int_0^x \left(\sqrt[3]{t}-t^2\right)dt$$

b) Given that $\int_0^1 f(x)dx=2$ **;** $\int_1^2 f(x)dx=-5$ **and** $\int_0^3 f(x)dx=4$

Evaluate the integral $\int_2^3 5f(x)dx$

c) Evaluate the integral $\int_0^4 |x-2|dx$ **(show all your steps)**

***Q.9** (5 points each):* **Solve the following differential equation:**

a) $\cos^2 x.\frac{dy}{dx} + y = 1 \quad ; \quad y(0) = 5$

b) $y' = \frac{xy}{1+x^2}$