Prince Sultan University
Department of Mathematical Sciences
Major III Exam
Semester I, 2009   FALL (091)
16th January, 2010
MATH 113 – CALCULUS II

Time Allowed   : 90 minutes
Maximum Points: 100 points

Name of the student: _____

ID number   : _____

Section   :   **221**

For All The Students:

- **Answer all the questions.**

- **This exam consists of _5 questions and a total of 7 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	60	
Q.2	4	
Q.3	10	
Q.4	4	
Q.5	22	
Total	**100**	

Q.1 (6 points each): Evaluate the following integrals:

a) $\int x \sec^2 x \, dx$

b) $\int \sec^5 \theta \tan \theta \, d\theta$

c) $\int \frac{-3x-1}{x^3 - x^2} dx$

d) $\displaystyle \int \frac{1}{\left(9+x^2\right)^{\frac{3}{2}}}\, dx$

e) $\displaystyle \int \frac{2x^2-3x}{(x^2+1)(3x+2)}\, dx$

f) $\displaystyle\int \frac{\cos t}{9+\sin^2 t}\,dt$

g) $\displaystyle\int \sin^3 2x \cos^2 2x\,dx$

h) $\displaystyle\int \frac{2x-6}{\sqrt{1-x^2}}\,dx$

i) $\int x^3 e^{4x} dx$

j) $\int x^2 \sqrt{x^2 - 4}\, dx$

Q.2 (4 points): Find $\dfrac{dy}{dx}$ for $y = x^4 \cosh 2x$

Q.3 (10 points): Evaluate the following integral **_using two different methods._**

$$\int \frac{e^x \, dx}{\sqrt{1-e^{2x}}}$$

Q.4 (4 points): Prove the identity $\sinh 2x = 2\sinh x \cosh x$

Q.5 (22 points): Evaluate the given limits.

a) $\lim\limits_{x \to \pi^-} \csc 2x \sin 5x$

b) $\lim\limits_{x \to 0} \dfrac{\cos x - 1}{x^2}$

c) $\lim\limits_{x \to \infty} \left(\sqrt{x^2 + 1} - x \right)$

d) $\lim\limits_{x \to 0} \left(e^x + x \right)^{\frac{1}{x}}$