Prince Sultan University

Department o f Mathematical Sciences

Major I Exam

Semester I, FALL 2009 (091)

2nd November, 2009

MATH 113 – CALCULUS II

Time Allowed : 90 minutes

Maximum Points: 100 points

Mr. Khaled Naseralla

Name of the student : _____

ID number : _____

Section : ____**221**_____

For All The Students:

- **Answer all the questions.**
- **This exam consists of *a total of 6 pages and 11 questions.***
- **Show your working in the space provided for each question.**
- **Show all the key steps of your work.**
- **Scientific, non-programmable calculators are allowed.**

Question	Maximum score	*Your Score*
1 , 2	42	
3 , 4 , 5 , 6	24	
7 , 8	13	
9 , 10 , 11	21	
Total	**100**	

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Q.1 (36 points) **: Evaluate the following integrals. (Show your work)**

a) $\int_{-5}^{5} f(x)dx$ if $f(x)=\begin{cases} x^3 & \text{if } x>1 \\ 5-x^2 & \text{if } x\le 1 \end{cases}$

b) $\int x^2\left(x^3+9\right)^8 dx$

c) $\int \cos^4(3t)\sin(3t)dt$

d) $\int_{1}^{3} x^3(2x+\frac{1}{x^4})dx$

e) $\int \frac{3x+6}{2x^2+8x+3}dx$

f) $\int \frac{\cos 3x}{\sqrt{5+2\sin 3x}}dx$

Q.2 (6 points): Suppose that $F(x)$ is a continuous function and suppose that $F(-1)=3$, $F(3)=5$, $F'(-1)=2$ and $F'(3)=-2$. Find the following:

a) $\int_{-1}^{3} F'(x)dx$

b) $\int_{-1}^{3} F''(x)dx$

c) $\int_{-1}^{3} [F(x)]^2 .F'(x)dx$

Q.3 (6 points): Let $F(x)=\int_4^x (10t^2+\sqrt{t})dt$ Find

a) $F(4)$

b) $F'(4)$

c) $F''(4)$

Q.4 (4 points): Given $\int_6^8 f(x)dx=3$, $\int_8^{20} f(x)dx=7$ and $\int_6^{20} g(x)dx=8$

Find $\int_6^{20}[6f(x)+g(x)]dx$

Q.5 (6 points): **Evaluate** $\sum_{k=1}^{12} k(3k+2)$

Q.6 (8 points): Use the limit of the **Riemann Sum** to find the area under the curve $f(x)=5-2x$ over the interval $[0,1]$, using x_k^* as the right endpoint of each subinterval.

Q.7 (8 points): The velocity of an object moving along an $S-axis$ is given by: $v(t)=(2t^3-2t)\ \ m/s$

i) Find the total distance the object travels over the period $0 \le t \le 4$

ii) Find the position of the object at $t=3$ seconds given that $S(0)=-3$

iii) Find the acceleration of the object at $t=2$ seconds

Q.8 (5 points): A ball is fired vertically upward from ground level with an initial velocity $64\ ft/s$
Determine the maximum height the ball reaches.

$$S=S_\circ+V_\circ t-\frac{1}{2}gt^2$$
$$V=V_\circ-gt$$
$g=-32\ ft/s^2$ or
$g=-9.8 m/s^2$

Q.9 (7 points): Find the value(s) of x^* that satisfies the Mean-Value Theorem for the function $f(x) = 3x + 1$ on the interval $[0, 6]$

Q.10 (6 points): Solve the initial value problem:

$$\frac{dy}{dx} = \cos x - 5x \quad , \quad y(0) = 4$$

Q.11 (8 points): Use the definite integral to find the area between $f(x) = |x - 1| + 2$ and the $x-axis$ over the interval $[0, 5]$. Sketch the graph of $f(x)$ to verify the area using geometric formula.