Prince Sultan University

Department of Mathematical Sciences

Major I Exam

Semester I, 2012 FALL (121)

13th October 2012

MATH 111 – CALCULUS I

Time Allowed : 90 minutes
Maximum Points: 60 points

Name of the student: _____

ID number : _____

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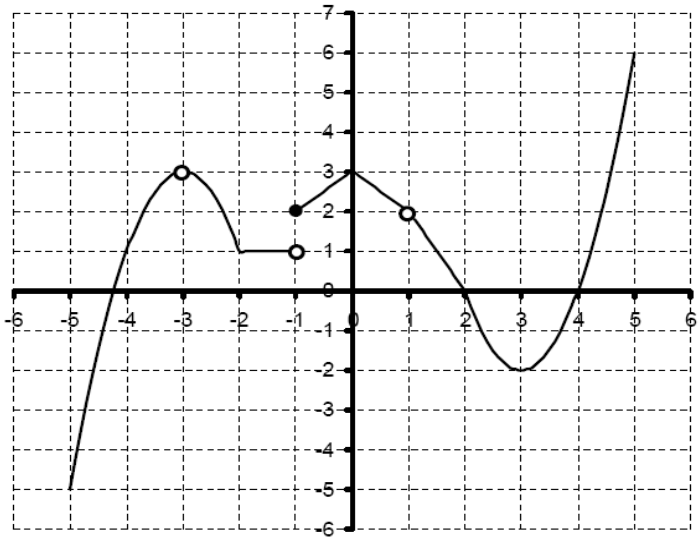
Section 250	Section 224	Section 249	Section 223
10 ---- 11	11 ----- 12	8 ----- 9	10 ----- 11

Important Instructions

- You may use a **SCIENTIFIC CALCULATOR** that does **NOT** have **GRAPHING** capabilities.
- You may **NOT** borrow a calculator from anyone.
- Answer **ALL** the questions.
- Show all the key steps of your work in the space provided for each question. Please indicate your **FINAL** answers clearly.
- You may use the **BACK** of the pages for extra space, but be sure to indicate that on the page with the problem.
- There should be **NO** talking during the exam.
- This exam has **11** problems, some with several parts. Make sure your paper has all these problems.

Question	Maximum Points	*Points Earned*
1 , 2 , 3	11	
4 , 5	24	
6 , 7 , 8	12	
9 , 10 , 11	13	
Total	**60**	

Q.1 (4 points): Use the following graph to answer the following questions



(i) $\lim_{x \to -1} f(x)$

(ii) $\lim_{x \to -3} f(x)$

(iii) $\lim_{x \to -\infty} f(x)$

Q.2 (4 points): Given $f(x) = x^2 - 4x$ and $g(x) = \sqrt{2-3x}$, determine:

(i) $f \circ g(x)$

(ii) $f(2) \cdot g(2)$

(iii) $g(f(1))$

(iv) Domain of $f \circ g$

Q.3 (3 points): Find the inverse function (if any): $f(x) = \dfrac{2x-3}{1-4x}$

Q.4 (20 points): Evaluate the limit, if it exists.

(i) $\lim_{x\to 1}\dfrac{x^3-1}{x^2+2x-3}$

(ii) $\lim_{x\to 3}\dfrac{\dfrac{x}{x+2}-\dfrac{3}{5}}{x-3}$

(iii) $\lim_{x\to -2}\dfrac{x^3+8}{\left|x^2-4\right|}$

(iii) $\lim_{h\to 0}\dfrac{2(-3+h)^2-18}{h}$

(iv) $\lim_{t\to+\infty} 3t - \sqrt{9t^2+4t+1}$

(vii) $\lim_{x\to-\infty} \dfrac{1-e^{-2x}}{1+2e^{-2x}}$

Q.5 (4 points): Begin by graphing $f(x)=\sqrt{x}$, then use transformations to sketch the graph of $g(x)=3-\sqrt{x-1}$

Q.6 (4 points): Solve for x : $2\log(x)+\log(x^2-1)=\log\left(\log_2(4)\right)$

Q.7 (5 points): Find the **Domain and the Range** of:

(i) $f(x)=-2x^2+5x-4$

(ii) $g(x)=\dfrac{1-4^{-2x}}{3}$

Q.8 (3 points): Show that $e^x+2x=3$ has a root in the interval $(0,1)$

Q.9 (4 points): Find the value of *k*, if possible, that will make the function continuous everywhere $f(x)=\begin{cases} x+2k & x\le 1 \\ kx^2+x+1 & x>1 \end{cases}$

Q.10 (6 points): Discuss the continuity of f. Find the numbers at which f is not continuous.

$$f(x)=\begin{cases} \dfrac{x-1}{x+2} & x\le 1 \\ -1+\dfrac{1}{x} & 1<x<4 \\ 2\sqrt{x^2-1} & x\ge 4 \end{cases}$$

Q.11 (3 points): Find the horizontal asymptote(s) of the curve $f(x)=\dfrac{x^2\sin(x)}{x^4+1}$