Prince Sultan University
Orientation Mathematics Program

MATH 111

Major Test III

Semester I, Term 141

Sunday, December 21st, 2014

Time Allowed: **50** minutes

Student Name: _____

Student ID #: _____ Section #: **224**

Teacher's Name: **Dr. Aiman Mukheimer**

Serial Number:

Important Instructions:

1. You may use a scientific calculator that does not have programming or graphing capabilities.
2. You may NOT borrow a calculator from anyone.
3. You may NOT use notes or any textbook.
4. There should be NO talking during the examination.
5. Your exam will be taken immediately if your mobile phone is seen or heard
6. Looking around or making an attempt to cheat will result in your exam being cancelled
7. This examination has 4 problems, some with several parts. Make sure your paper has all these problems.

Problems	Max points	Student's Points
1	16	
2,3	22	
4	12	
Total	50	/50

1. (16 points) Find the derivatives of the functions below

(a) $y = \sqrt[5]{\dfrac{\cot(x+1)}{(2x+3)^3 \cdot \sqrt{x}}}$ (using logarithmic differentiation)

(b) $\dfrac{e^{xy}}{y+e^{2x}} = x$

(c) $x^7 y = \cosh(xy)$

(d) $y = (\cos x)^{\ln x}$

2. (2+4=6 points) Consider the function $f(x) = x^3 + x - 1$, on the interval $[0, 2]$. Verify that it satisfies the conditions of the Mean Value Theorem. Then find all numbers c that satisfy the conclusion of the Mean Value Theorem.

3. (16 points) Given function f by $f(x) = 2 + 2x^2 - x^4$

(a) Find the critical points of f and the regions of increase and regions of decrease.

(b) Find the local minimum points and local maximum points.

(c) Study the inflection points and concavity regions.

(d) Find the absolute maximum point and absolute minimum point for f on $[-1,1]$.

4. (12 points) Use L'Hospital's rule to get the limits below

a) $\lim_{x\to\infty} \frac{(\ln x)^2}{x}$

b) $\lim_{x\to 0^+} (\cos x)^{\frac{1}{x^2}}$

c) $\lim_{x\to\infty} (xe^{1/x} - x)$

d) $\lim_{x\to 0} \frac{\tanh x}{\tan x}$