Prince Sultan University

Math 113
Major Exam 3
Second Semester, Term 122
Monday, May 13, 2013

Time Allowed: 120 minutes

Student Name:_____ _____ _____

Student ID #: _____

Serial Class #:_____ Section #: 227 or 228

Instructor's Name: Dr. Aiman Mukheimer

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. Talking during the examination is NOT allowed.
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 10 problems, some with several parts. Make sure your paper has all these problems.

Problems	Max points	Student's Points
1	15	
2	15	
3,4,5	15	
6,7	20	
8	15	
9	10	
10	10	
Total	100	

1. (15 points) Determine whether the following sequences converge or diverges. If it converges, find its limit.

i. $a_n = \left\{\ln(2n^2+1) - \ln(n^2+1)\right\}_{n=1}^{\infty}$

ii. $a_n = \left\{\dfrac{\sin^2(n)}{5^n}\right\}_{n=1}^{\infty}$

iii. $a_n = \left\{\dfrac{(4)^n}{n!}\right\}_{n=1}^{\infty}$

2. (15 points) Determine whether the following series converges or diverges; if it's converge find the sum: **Justify your answers in details.**

i. $\sum_{n=0}^{\infty} \frac{\pi^n}{3^{n+1}}$

ii. $\frac{1}{(1)\cdot(4)} + \frac{1}{(2)\cdot(5)} + \frac{1}{(3)\cdot(6)} + \frac{1}{(4)\cdot(7)} + \cdots\cdots$

3. (5 points) Find a formula for the general term a_n of the sequence, assuming that the pattern of the first few terms continues and then find the limit of the sequence.

$$\left\{\sqrt{2}, \sqrt{2\sqrt{2}}, \sqrt{2\sqrt{2\sqrt{2}}}, \sqrt{2\sqrt{2\sqrt{2\sqrt{2}}}}, \ldots\ldots\ldots\ldots\ldots\right\}$$

4. (5 points) Express the repeating decimal $4.53232323232\cdots\cdots\cdots\cdots$ as a fraction.

5. (5 points) Find the radius of convergence of the power Series: $\sum_{n=1}^{\infty} \frac{(2n)!}{(n!)^2} x^n$

6. (10 points) Determine whether the following series converges or diverges.

i. $\sum_{n=1}^{\infty} \frac{\sqrt{n}+4}{n^2}$

ii. $\sum_{n=1}^{\infty} \frac{7n^4+11n+3}{3n^5+8n-7}$

7. (10 points) Find the interval of convergence and radius of convergence of the power Series: $\sum_{n=1}^{\infty} \frac{(x+2)^n}{n\ 4^n}$

8. (15 points) Determine whether the following series converges or diverges.

i. $\displaystyle\sum_{n=1}^{\infty} \frac{\sin((n+\frac{1}{2})\pi)}{1+\sqrt{n}}$

ii. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{7n-5}{8n-2}$

iii. $\displaystyle\sum_{n=1}^{\infty} (-1)^{n-1}\, e^{2/n}$

9. (10 points) Determine whether the following series absolutely convergent, conditionally convergent or divergent. **Justify your answers in details.**

i. $\sum_{n=1}^{\infty} (-1)^n \frac{n^n}{n!}$

ii. $\sum_{n=1}^{\infty} (-1)^n \frac{2^n n!}{5 \cdot 8 \cdot 11 \cdots\cdots (3n+2)}$

10.(10 points) Determine whether the following series absolutely convergent, conditionally convergent or divergent. **Justify your answers in details.**

i. $\sum_{n=3}^{\infty} \frac{(-1)^{n+1}}{\ln n}$

ii. $\sum_{n=1}^{\infty} \frac{(-1)^{n}}{\cosh n}$