Prince Sultan University

Math 113
Major Exam 3
Second Semester, Term 142
Saturday, May 9, 2015

Time Allowed: 90 minutes

Student Name:_____ _____ _____

Student ID #: _____

Serial Class #:_____ Section #:

Instructor's Name: Dr. Aiman Mukheimer, Dr. Bahaaeldin Abdalla, Dr. Saleem

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 5 problems, some with several parts. Make sure your paper has all these problems.

Problems	Max points	Student's Points
1,2	8	
3	8	
4	12	
5	12	
Total	40	

1. (5 points in total) Determine whether the following sequences converge or diverge. If it's converges, find its limit.

i. (3 points) $a_n = \left(1+\frac{\pi}{n}\right)^n$

ii. (2 points) $a_n = \frac{\cos 3n}{3^n}$

2. (3 points) Find a formula for the general term a_n of the sequence and then determine whether the sequence converges or diverges. If it converges, find its limit.

$$e^2, e^{3/4}, e^{4/9}, e^{5/16}, e^{6/25}, e^{7/36}, e^{8/49}, \ldots\ldots$$

3. (8 points in total) Find the **<u>sum</u>** of each of the following series. **Justify your answers in details.**

i. (3 points) $\frac{3}{2}+\frac{2}{3}+\frac{3}{4}+\frac{4}{9}+\frac{3}{8}+\frac{8}{27}+\frac{3}{16}+\frac{16}{81}+\frac{3}{32}+\frac{32}{243}+\cdots\cdots$

ii. (3 points) $\sum_{n=5}^{\infty}\frac{3}{n^2-n}$

iii. (2 points) The series that has the *n*th partial sum: $S_n=\frac{\sqrt[3]{3n^3+5n+10}}{5n+7}$

4. (12 points in total) Determine whether the following series converges or diverges. **Justify your answers in details.**

i. $\sum_{k=1}^{\infty} \sqrt{k} \tan\left(\frac{1}{\sqrt{k}}\right)$

ii. $\sum_{n=1}^{\infty} \frac{\sqrt{7n^2+11n}}{3n^3+8n^2-7}$

iii. $\sum_{n=1}^{\infty} \frac{5}{4n+n\sin^2 n}$

5. (12 points in total) Determine whether the following series absolutely convergent, conditionally convergent or divergent. **Justify your answers in details.**

i. (7 points) $\sum_{n=2}^{\infty} \frac{(-1)^n}{n\sqrt[3]{\ln n}}$

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