University of South Carolina

Midterm Examination 2 October 24, 2016

Math 142–003/004

Closed book examination Time: 75 minutes

Name ______________________________

Instructions:

No notes, books, or calculators are allowed. If you need more space than is provided use the back of the previous page and clearly indicate you have done so. Simplify your final answers. **Full credit may not be awarded for insufficient accompanying work.**

1		9
2		9
3		9
4		9
5		12
6		8
Total		56

1. (9 points) Find the limit of each of the following sequences or explain why the limit does not exist.

(a) $\lim_{n\to\infty} \frac{4n^2 + 2n - 1}{n^3 + 1}$

(b) $\lim_{n\to\infty} \frac{n^2}{2^n}$

(c) $\lim_{n\to\infty} (3n)^{4/n}$

2. (9 points) Find the value of each of the following series or explain why the series diverges.

(a) $\displaystyle\sum_{n=1}^{\infty} n$

(b) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{1}{3}\right)^n$

(c) $\displaystyle\sum_{n=0}^{\infty} \frac{3^n - 2}{4^n}$

3. (9 points) For each series, what can you conclude from the given convergence test?

(a) $\sum_{n=1}^{\infty} e^{-n}$ using the Integral Test.

(b) $\sum_{n=1}^{\infty} \frac{2^n}{n!}$ using the Ratio Test.

(c) $\sum_{n=1}^{\infty} \frac{3^n}{n^3}$ using the Root Test.

4. (9 points) For each series, what can you conclude from the given convergence test?

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{3}{n+1}$ using the Limit Comparison Test with $\displaystyle\sum \frac{1}{n}$.

(b) $\displaystyle\sum_{n=4}^{\infty} \frac{1}{n^2+1}$ using the Limit Comparison Test with $\displaystyle\sum \frac{1}{n}$.

(c) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n-1}$ using the Direct Comparison Test with $\displaystyle\sum \frac{1}{n}$.

5. (12 points) For each of the following series, determine if it converges or diverges.

(a) $\displaystyle\sum_{n=0}^{\infty} \frac{2}{(n+1)^n}$

(b) $\displaystyle\sum_{n=3}^{\infty} \frac{n^2+2n-1}{n^4-2n+3}$

(c) $\displaystyle\sum_{n=1}^{\infty} \frac{n^2}{(2n)!}$

6. (8 points) For each of the following series, determine if it

- converges absolutely,
- converges conditionally, or
- diverges.

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{n}$

(b) $\displaystyle\sum_{n=2}^{\infty} \frac{(-1)^{n+1} n}{\ln(n)}$

The End