

Math 143: Calculus III

Midterm I

October 6th, 2016

NAME (please print legibly): _____

Your University ID Number: _____

Your University email _____

Pledge of Honesty

I affirm that I will not give or receive any unauthorized help on this exam and that all work will be my own.

Signature: _____

- The use of calculators, cell phones, iPods and other electronic devices at this exam is strictly forbidden.
- Show your work and justify your answers. You may not receive full credit for a correct answer if insufficient work is shown or insufficient justification is given.
- Put your answers in the spaces provided.
- You are responsible for checking that this exam has all 9 pages.

QUESTION	VALUE	SCORE
1	9	
2	12	
3	10	
4	10	
5	15	
6	16	
7	14	
8	14	
TOTAL	100	

1. (9 points) Determine whether the following sequences converge. If they converge find their limit. **Justify and show all your work.**

(a)

$$a_n = \cos(n)$$

(b)

$$a_n = \sin\left(\frac{1}{n}\right)$$

(c)

$$a_n = \ln(2n + 3) - \ln(3n + 2)$$

2. (12 points) Determine whether the following sequences converge. If they converge find their limit. **Justify and show all your work.**

(a)

$$a_n = \frac{\sin(n)}{n^2}$$

(b)

$$a_n = \frac{\ln(n)}{n}$$

(c)

$$a_n = \frac{e^n}{n^2 + 1}$$

3. (10 points) Determine whether the following series converge or diverge and justify your answer. If they converge find their sum. **Justify and show all your work.**

(a)

$$\sum_{n=0}^{\infty} \left(\frac{-9}{5}\right)^n$$

(b)

$$\sum_{n=0}^{\infty} \frac{3^n + 4^n}{5^n}$$

4. (10 points) Determine whether the following series converge or diverge and justify your answer. If they converge find their sum. **Justify and show all your work.**

(a)

$$\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$$

(b)

$$\sum_{n=1}^{\infty} e^{-n} - e^{-(n+1)}$$

5. (15 points) Use the integral test to determine whether the following series converges or diverges. **To get full credit you must use the integral test.**

(a)

$$\sum_{n=1}^{\infty} \frac{1}{n}$$

(b)

$$\sum_{n=1}^{\infty} 3n^2 e^{-n^3}$$

6. (16 points) Use the comparison test or the limit comparison test to determine whether the following series converge or diverge. **To get full credit you must use the comparison test or the limit comparison test.**

(a)

$$\sum_{n=1}^{\infty} \frac{5^n - n}{6^n + 9}$$

(b)

$$\sum_{n=1}^{\infty} \frac{\arctan(n)}{n^{1.2}}$$

7. (14 points) Determine whether the following series converge or diverge. **Justify and show all your work.**

(a)

$$\sum_{n=1}^{\infty} \frac{n}{2n+5}$$

(b)

$$\sum_{n=2}^{\infty} \frac{\sqrt{n}}{n - \sqrt{n}}$$

8. (14 points) Determine whether the following series converge or diverge. **Justify and show all your work.**

(a)

$$\sum_{n=1}^{\infty} \frac{n}{n^3 + 5n}$$

(b)

$$\sum_{n=1}^{\infty} \frac{\ln(n)}{n}$$