MARK BOX		
PROBLEM	POINTS	
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
USCvsClemson	2	
%	100	

NAME: ____________________

SSN: ______________________

Section 007 (MW 12:20pm)

or

Section 008 (MW 2:30pm)

INSTRUCTIONS:

(1) To receive credit you must:
   (a) work in a logical fashion, show all your work, indicate your reasoning
   (b) when applicable put your answer on/in the line/box provided
   (c) if no such line/box is provided, then box your answer

(2) The MARK BOX indicates the problems along with their points.
Check that your copy of the exam has all of the problems.

(3) You may **not** use a calculator, books, personal notes. Give exact answers: for example, write $\ln 2$ instead of .6931, write $\sqrt{2}$ instead of 1.414, write π instead of 3.1415, write $\frac{1}{3}$ instead of 0.3333.

(4) During this exam, do not leave your seat. If you have a question, raise your hand. When you finish: turn your exam over, put your pencil down, and raise your hand.

(5) This exam covers (from *Calculus* by Varberg, Purcell, Rigdon, 8^{th} ed.): Chapter 10 and Section 11.1 .

ADDITIONAL INSTRUCTIONS

In problems 1 - 3, find the limit of each sequence.
In problems 5 - 8, check the appropriate box of what that series is doing.
Always justify your answer.

1.

$$\lim_{n\to\infty} \qquad \frac{17n^2 - 3n + 1}{3n^2 - 17n + 100} \quad =$$

2.

$$\lim_{n\to\infty} \quad \frac{3n^2+4}{n-1} \quad =$$

Warning: beware, the degree of the polynomial in the numerator does not equal the degree of the polynomial in the denominator. So divide through by the dominating power to see what happens towards infinity.

3.

$$\lim_{n\to\infty} \quad (0.999999999)^n \quad =$$

Warning: do not confuse a sequence with a series.

4. Explicitly find the sum of the geometric series

$$\sum_{n=4}^{\infty} 8\left(\frac{1}{6}\right)^n \quad = \quad \boxed{}\,.$$

Note that the above series starts at $n = 4$. Recall that if $|r| < 1$ then (starting at $n = 0$)

$$\sum_{n=0}^{\infty} r^n \;=\; 1 + r + r^2 + r^3 + \ldots \;=\; \frac{1}{1-r}\,.$$

5. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \ \frac{3^n}{n!}$

☐ absolutely convergent

☐ conditionally convergent

☐ divergent

6. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{1}{\sqrt{n+1}}$

- ☐ absolutely convergent
- ☐ conditionally convergent
- ☐ divergent

7. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \; \frac{(n^2+1)}{2n^2+n-1}$

☐ absolutely convergent

☐ conditionally convergent

☐ divergent

Think before you dive in.

8. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \; \frac{2^n\,3^n}{n^n}$

☐ absolutely convergent

☐ conditionally convergent

☐ divergent

Hint: Root Test.

9. Consider the formal power series

$$\sum_{n=1}^{\infty} \frac{(3x+6)^n}{n} \ .$$

As we did in class, in the box below draw a diagram indicating for which x's this series is: absolutely convergent, conditionally convergent, and divergent. Of course, indicate your reasoning. Don't forget to check the endpoints.

10. Consider the function $f(x) = \ln(2+x)$. Let $a = 0$. We know that we can write the function as

$$f(x) = P_2(x) + R_2(x)$$

where P_2 is the second order Taylor polynominal of f about $a = 0$ and R_2 is the corresponding remainder term.

10a. Find $P_2(x)$.

$P_2(x)$=

10b. Find a formula for the remainder term $R_2(x)$. Your answer should have a "c" in it, be sure to indicate where c lies.

$R_2(x)$=

10c. Find a good upper bound for $|R_2(0.5)|$. Your answer should **not** have a "c" in it but you do not have to do arithmetic. **Do you work on the back of the previous page.**

$\|R_2(0.5)\| \leq$