NAME ______________________________

STUDENT ID ______________________________

RECITATION INSTRUCTOR ______________________________

RECITATION TIME ______________________________

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DIRECTIONS

1. Write your name, student ID number, recitation instructor's name and recitation time in the space provided above. Also write your name at the top of pages 2, 3, and 4.
2. The test has four (4) pages, including this one.
3. Write your answers in the boxes provided.
4. You must show sufficient work to justify all answers. Correct answers with inconsistent work may not be given credit.
5. Credit for each problem is given in parentheses in the left hand margin.
6. No books, notes or calculators may be used on this test.

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(9) 1. Determine whether the following statements are true or false (circle T or F). (You do not need to show work for this problem).

(a) If $\lim_{n\to\infty} a_n = 0$, then $\sum_{n=1}^{\infty} a_n$ converges. T F

(b) If $0 \le a_n \le b_n$ for all $n \ge 1$, and $\sum_{n=1}^{\infty} a_n$ diverges, then $\sum_{n=1}^{\infty} b_n$ diverges. T F

(c) If $\sum_{n=1}^{\infty} a_n$ diverges, then $\sum_{n=1}^{\infty} |a_n|$ diverges. T F

(9) 2. Determine whether each of the following series is absolutely convergent, conditionally convergent or divergent. (You do not need to show work for this problem).

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

(b) $\sum_{n=1}^{\infty} \frac{\sin(2n)}{n^2}$

(c) $\sum_{n=1}^{\infty} (-1)^n \sqrt{n}$

(27) 2. Determine whether each series is convergent or divergent. You must verify that the conditions of the test are satisfied and write your conclusion in the small box.

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{n}{\sqrt{n^3+4}}$.

Show all necessary work here :

By the test, the series is

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

Show all necessary work here :

By the test, the series is

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

Show all necessary work here :

By the test, the series is

(12) 4. Find the sum of the series if it is convergent or write "divergent" in the box. No partial credit.

(a) $\sum_{n=0}^{\infty} \frac{3(-4)^n}{5^{n+1}}$

(b) $\sum_{n=1}^{\infty} \frac{(-6)^{n-1}}{5^{n-1}}$

(c) $\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{4}} + \frac{1}{\sqrt{6}} + \frac{1}{\sqrt{8}} + \cdots$

(8) 5. Consider the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n!}$.

(a) Write out the first six terms of the series.

(b) Find the smallest number of terms that we need to add in order to estimate the sum of the series with error < 0.01.

(16) 6. For the power series $\sum_{n=1}^{\infty} (-1)^n \frac{x^n}{n^2 5^n}$, find the following, showing all work.

(a) The radius of convergence R.

$R =$

(b) The interval of convergence. (Don't forget to check the end points).

Interval of convergence

(10) 7(a). Find the power series representation for $\frac{1}{5-x}$.

$\frac{1}{5-x} = \sum$

(b) Find the power series representation for $\frac{1}{(5-x)^2}$. (Hint: Use part (a) and differentiation).

$\frac{1}{(5-x)^2} = \sum$

(9) 8. Find the first three nonzero terms of the Taylor series of $f(x) = \sqrt{x}$ centered at $a = 4$.