NAME ______________________________

10–DIGIT PUID ______________________________

RECITATION INSTRUCTOR ______________________________

RECITATION TIME ______________________________

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TOTAL	/100

DIRECTIONS

1. Write your name, 10–digit PUID, 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 unless otherwise stated in the problem. 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, calculators, or any electronic devices may be used on this test.

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(12) 1. Determine whether the following statements are true or false for any series $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} b_n$. (Circle T or F. You do not need to show work).

(a) If $0 < a_n < b_n$ for all n and $\sum_{n=1}^{\infty} a_n$ converges, then $\sum_{n=1}^{\infty} b_n$ converges T F

(b) If $\sum_{n=1}^{\infty} a_n$ diverges and $\sum_{n=1}^{\infty} b_n$ diverges, then $\sum_{n=1}^{\infty} (a_n + b_n)$ diverges. T F

(c) $\left| \sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n^2} - (1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2}) \right| \le \frac{1}{25}$ T F

(12) 2. Determine whether each of the following series is convergent or divergent. (You do not need to show work).

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

(b) $\displaystyle\sum_{n=1}^{\infty} \cos(\frac{1}{n^2})$ $\boxed{}$

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

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

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

Show all necessary work here:

By the test, the series is

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

Show all necessary work here:

By the test, the series is

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

Show all necessary work here:

By the test, the series is

(4) 4. $\sum_{n=0}^{\infty} \frac{3}{4^n} =$

(6) 5. Determine whether the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n+1}}$ is absolutely convergent, conditionally convergent, or divergent. You must justify your answer.

(5) 6. Find the Taylor series of the function $f(x) = e^x$ centered at $a = 3$.

$e^x = \sum$

(14) 7. For the power series $\sum_{n=0}^{\infty} \frac{(-1)^n x^n}{n+1}$, 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

(20) 8. For each function f find its Maclaurin series and radius of convergence. You may use known series to get your answer.

(a) $f(x) = \frac{1}{1+x}$

$\frac{1}{1+x} = \sum$, $R =$

(b) $f(x) = \frac{1}{(1-x)^2}$. (Hint: $\frac{d}{dx}\frac{1}{1-x} = \frac{1}{(1-x)^2}$)

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

(c) $f(x) = e^{3x}$

$e^{3x} = \sum$, $R =$

(d) $f(x) = \sin x$.

$\sin x = \sum$, $R =$