

NAME(print in CAPITAL letters, first name first): \_\_\_\_\_

NAME(sign): \_\_\_\_\_

ID#: \_\_\_\_\_

**Instructions:** There are six problems. Make sure that you have all 6 problems. Show all of your work.

Points received:

\_\_\_\_\_

1

2

3

4

5

6

TOTAL

1. (24 points.) For each series below, if the series converges then find its sum; otherwise, state that it diverges.

(a)  $\sum_{n=1}^{\infty} \left(\frac{1}{2}\right)^n$

(b)  $\sum_{n=1}^{\infty} \left(\frac{3}{2}\right)^n$

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

2. (24 points.) For each series below, state whether it converges or diverges.

(a)  $\sum_{n=2}^{\infty} \frac{1}{n \ln n}$

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

3. (24 points.) For each series below, state whether it converges or diverges.

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

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

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

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

4. (24 points.) For each series below, state whether it converges absolutely, converges conditionally, or diverges

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

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

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

(d)  $\sum_{n=2}^{\infty} (-1)^n \frac{n}{n^3 - 1}$

5. (12 points.) Does the following series converge absolutely, converge conditionally, or diverge?

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

6. (24 points.) Consider the power series

$$\sum_{n=1}^{\infty} \frac{(x-1)^n}{n2^n}.$$

- (a) Find the interval of convergence.

- (b) Find the radius of convergence.

- (c) Find all values of  $x$  such that the series is conditionally convergent.