

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.