

Name:

Date:

Worksheet 9, Math 10560

1. (a) Give a definition of conditional convergence.

- (b) Which series below conditionally converges (justify your answer)?

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

ii)
$$\sum_{n=1}^{\infty} \frac{(-1)^n 7^n}{\sqrt{n}}$$

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

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

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2. (a) Say whether or not the following series are convergent and how you arrived at your conclusion including which test you used and how it applies.

i)
$$\sum_{n=1}^{\infty} \frac{e^n}{n^2 + e^n}$$

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

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

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

3. Find the radius of convergence and interval of convergence of the following power series

$$\sum_{n=1}^{\infty} \frac{(-1)^{n-1} (x-2)^n}{\sqrt{n}}.$$

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Some Extra Old Exam Questions

4. Find $\sum_{n=1}^{\infty} \frac{2^{2n}}{5^{n-1}}$.

- (a) 20
- (b) $\frac{4}{5}$
- (c) $\frac{5}{4}$
- (d) 4
- (e) 5

5. Test the following series for absolute convergence, conditional convergence or divergence:

$$(1) \sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}}; \quad (2) \sum_{n=1}^{\infty} \frac{(-1)^n}{(1.2)^n}; \quad (3) \sum_{n=1}^{\infty} \frac{(-1)^n}{n^{1.2}}.$$

- (a) (1) converges conditionally, (2) and (3) converge absolutely
- (b) (1) and (2) converge conditionally, (3) converges absolutely
- (c) (1) and (2) converge absolutely, (3) converges conditionally
- (d) (1) and (3) converge absolutely, (2) converges conditionally
- (e) (1) converges absolutely, (2) and (3) converge conditionally.

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6. Find the center a and the radius of convergence R for

$$\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n^2 + 2}} \left(\frac{x+1}{2} \right)^n.$$

(a) $a = -1, R = 2$

(b) $a = -\frac{1}{2}, R = 2$

(c) $a = 1, R = 2$

(d) $a = -1, R = 1$

(e) $a = -1, R = \frac{1}{2}$

7. Consider the following series

$$(I) \quad \sum_{n=1}^{\infty} \frac{n \cdot 3^n}{(n+1)!} \qquad (II) \quad \sum_{n=1}^{\infty} \left(\frac{e^n}{2e^n + 1} \right)^n.$$

Which of the following statements is true?

(a) They both converge.

(b) They both diverge.

(c) (I) converges and (II) diverges.

(d) (I) diverges and (II) converges.

(e) The root test is inconclusive when applied to (II).