

YOUR NAME: _____

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Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Determine whether the following series converge and, if so, find the limit.

(a) $-\frac{4}{9} + \frac{8}{27} - \frac{16}{81} + \frac{32}{243} - \cdots$.

(b) $2 - \frac{5}{2} + \frac{25}{8} - \frac{125}{32} + \frac{625}{128} - \cdots$.

2. Determine whether the series $\sum_{n=1}^{\infty} \frac{1}{n + \sqrt{n}}$ converges. (Fully justify your answer.)

3. Determine whether the series $\sum_{n=2}^{\infty} \frac{\cos(\pi n)}{\sqrt[3]{n^2}}$ converges absolutely, conditionally or not at all (fully justify your answer).

4. Find the radius and the interval of convergence of the power series

$$\sum_{n=1}^{\infty} \frac{(x-1)^{2n+1}}{3n \cdot 4^n}.$$

5. Recall that $\frac{1}{1-x} = \sum_{n=0}^{\infty} x^n$, if $|x| < 1$. Find the Maclaurin series for the function

$$f(x) = x \ln\left(1 + \frac{x}{2}\right).$$

Table of Methods:

<u>Sequences</u>	<u>Series</u>	<u>Series w/ Positive Terms</u>
1. Function Method	1. Definition	1. Integral Test
2. Geometric Sequences	2. Telescoping Series	2. p -Series
3. Limit Laws	3. Linearity	3. Comparison Test
4. Squeeze	4. Geometric Series	4. Limit Comparison
5. Continuity	5. Divergence Test	
	6. Ratio Test	
	7. Root Test	