

Sequences and Series: math test, College – download the PDF

Suggested time: 45 minutes. Out of 20 points. Calculator allowed only when the problem says so.

1 Limits of sequences

/ 4 pts

Find the limit of each sequence, or show that it diverges.

a. $a_n = \frac{4n^2 - n}{2n^2 + 3}$

b. $b_n = \frac{(-1)^n n}{n + 1}$

c. $c_n = \sqrt{n^2 + n} - n$

2 Geometric series

/ 3 pts

a. Compute $\sum_{n=0}^{\infty} 5\left(-\frac{2}{3}\right)^n$.

b. Write $0.4545\dots$ as a fraction.

c. For which x does $\sum_{n=0}^{\infty} \left(\frac{x}{4}\right)^n$ converge? What is its sum?

3 Choosing a test

/ 4 pts

Decide whether each series converges and name the test.

a. $\sum \frac{5n}{n^3 + 2}$

b. $\sum \frac{n}{5n - 1}$

c. $\sum \frac{1}{n\sqrt{n}}$

4 Ratio and root tests

/ 4 pts

a. Use the ratio test on $\sum \frac{2^n}{n!}$.

b. Use the root test on $\sum \left(\frac{n}{2n + 1} \right)^n$.

5 An alternating series

/ 3 pts

Study $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{2n + 1}$: does it converge absolutely, conditionally, or diverge?

6 Power and Taylor series

/ 2 pts

a. Write the Maclaurin series of $\frac{1}{1 + x^2}$ using $\frac{1}{1 - u} = \sum u^n$.

b. What is its radius of convergence?



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