Multiple choice questions - Sequences and series convergence

Year: University Year 1 · 10

Question 1 $\sum \frac{1}{n^p}$ converges iff

- ◯ **A.** p
- ◯ **B.** $p \leq 1$
- ◯ **C.** $p > 1$
- ◯ **D.** $p \geq 1$

Question 2 $\sum_{n=0}^{\infty}(\frac{1}{3})^n =$

- ◯ **A.** $\frac{2}{3}$
- ◯ **B.** $\frac{3}{2}$
- ◯ **C.** 3
- ◯ **D.** $\frac{1}{3}$

Question 3 If $a_n \to 0$ then $\sum a_n$

- ◯ **A.** converges
- ◯ **B.** diverges
- ◯ **C.** may converge or diverge
- ◯ **D.** equals 0

Question 4 Ratio test with $\rho = 1$ is

- ◯ **A.** convergent
- ◯ **B.** divergent
- ◯ **C.** inconclusive
- ◯ **D.** absolutely convergent

Question 5 A bounded monotonic sequence

- ◯ **A.** diverges
- ◯ **B.** converges
- ◯ **C.** is constant
- ◯ **D.** is periodic

Question 6 The radius of convergence of $\sum x^n/n!$ is

- ◯ **A.** 0
- ◯ **B.** 1
- ◯ **C.** e

- ◯ **D.** ∞

Question 7 $\sum \frac{(-1)^n}{n}$ is

- ◯ **A.** absolutely convergent
- ◯ **B.** conditionally convergent
- ◯ **C.** divergent
- ◯ **D.** geometric

Question 8 $\sum \frac{1}{n(n+1)} =$

- ◯ **A.** 1
- ◯ **B.** 2
- ◯ **C.** ∞
- ◯ **D.** $\frac{1}{2}$

Question 9 The radius of convergence of $\sum nx^n$ is

- ◯ **A.** 0
- ◯ **B.** 1
- ◯ **C.** 2
- ◯ **D.** ∞

Question 10 $\sum \frac{1}{n^2+1}$ by comparison is

- ◯ **A.** divergent
- ◯ **B.** convergent
- ◯ **C.** conditionally convergent
- ◯ **D.** unknown

Answer grid - Sequences and series convergence

Year: University Year 1

Question	Answer	Explanation
1	**C**	p-series test.
2	**B**	$\frac{1}{1-1/3}$.
3	**C**	Harmonic series is a counterexample.
4	**C**	No information.
5	**B**	Monotone convergence theorem.
6	**D**	Factorial grows faster than any power.
7	**B**	Converges, but the absolute series is harmonic.
8	**A**	Telescoping.
9	**B**	Ratio $\frac{n}{n+1} \to 1$.
10	**B**	Smaller than $\sum \frac{1}{n^2}$.