

AP Calculus BC

Lesson 12.6 Absolute Convergence, Ratio & Root tests

1. Compute  $\lim_{n \rightarrow \infty} \left| \frac{a_{n+1}}{a_n} \right|$  for each of the following series.

(a)  $\sum_{n=1}^{\infty} \frac{4}{7^n}$

(b)  $\sum_{n=1}^{\infty} \frac{(-1)^n n}{4^n}$

(c)  $\sum_{n=1}^{\infty} \frac{1}{n}$

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

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

(f)  $\sum_{n=1}^{\infty} \frac{(-3)^n}{n^3}$

2. Which of the series in question 1 converge and which diverge?

3. Make a conjecture about the convergence of the infinite series  $\sum_{n=1}^{\infty} a_n$  and

$$\lim_{n \rightarrow \infty} \left| \frac{a_{n+1}}{a_n} \right|.$$

4. Compute  $\lim_{n \rightarrow \infty} \sqrt[n]{|a_n|}$  for each of the following series.

(a)  $\sum_{n=1}^{\infty} \left(\frac{2n+3}{5n-2}\right)^n$

(b)  $\sum_{n=1}^{\infty} \frac{(-3)^n}{n^3}$

5. Determine whether the series is absolutely convergent, conditionally convergent, or divergent.

a.  $\sum_{n=1}^{\infty} (-1)^n \frac{n^2}{3^n}$

b.  $\sum_{n=1}^{\infty} (-1)^n \frac{5^{2n+1}}{(2n+1)!}$

c.  $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{1}{(n+1)^{3/4}}$

d.  $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{6^n}{5^{n+1}}$

e.  $\sum_{n=1}^{\infty} (-1)^n \frac{n!}{10n}$

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

g.  $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{2^{3n}}{n^n}$

h.  $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{1}{[\ln(n+2)]^n}$