

10.5 AP Practice Problems (p.765) – Alternating Series Test & Absolute Convergence

1. Which of the following series converge?

I. $\sum_{k=1}^{\infty} (-1)^k \frac{1}{k^2}$

II. $\sum_{k=1}^{\infty} (-1)^k \left(\frac{5}{3}\right)^k$

III. $\sum_{k=1}^{\infty} (-1)^k \frac{1}{\sqrt{k}}$

- (A) I only (B) I and II only
(C) I and III only (D) I, II, and III

2. The alternating series $\sum_{k=1}^{\infty} \frac{(-1)^k k}{10^k}$ converges. What is

the maximum error incurred by using the first three nonzero terms to approximate the sum of the series?

- (A) -0.083 (B) 0.003 (C) 0.0004 (D) 0.0826

3. What is the fewest number of terms of the series $\sum_{k=1}^{\infty} \frac{(-1)^k}{k^3}$

that must be added to approximate the sum so that the error is less than or equal to 0.001?

- (A) 7 (B) 9 (C) 10 (D) 11

4. Which of the following series converge conditionally, but not absolutely?

I. $\sum_{k=1}^{\infty} (-1)^{k+1} \frac{3}{k}$

II. $\sum_{k=1}^{\infty} (-1)^{k+1} \left(\frac{1}{k}\right)^{4/3}$

III. $\sum_{k=0}^{\infty} (-1)^k \left(\frac{3}{4}\right)^k$

- (A) I only (B) I and II only
 (C) I and III only (D) I, II, and III

5. (a) Write out the first five terms of the series $\sum_{k=0}^{\infty} \frac{(-1)^k}{k!}$.

- (b) Show the series $\sum_{k=0}^{\infty} \frac{(-1)^k}{k!}$ converges.

- 58 (c) How many terms of the series are necessary to approximate the sum S with an error less than or equal to 0.0001?

6. Determine whether the series $\sum_{k=1}^{\infty} \frac{\cos(2k)}{4^k}$ converges absolutely, converges conditionally, or diverges. Show your work.