AP Calculus BC
Worksheet: Series

1. $\int_1^{\infty} \frac{x}{(1+x^2)^2}\,dx$ is

(A) $-\frac{1}{2}$ (B) $-\frac{1}{4}$ (C) $\frac{1}{4}$ (D) $\frac{1}{2}$ (E) divergent

2. The sum of the infinite geometric series $\frac{3}{2} + \frac{9}{16} + \frac{27}{128} + \frac{81}{1{,}024} + \cdots$ is

(A) 1.60 (B) 2.35 (C) 2.40 (D) 2.45 (E) 2.50

3. What are all values of x for which the series $\sum_{n=1}^{\infty} \frac{(x-2)^n}{n\,3^n}$ converges?

(A) $-3 \le x \le 3$

(B) $-3 < x < 3$

(C) $-1 < x \le 5$

(D) $-1 \le x \le 5$

(E) $-1 \le x < 5$

4. Which of the following series converge?

I. $\sum_{n=1}^{\infty} \frac{n}{n+2}$ II. $\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{n}$ III. $\sum_{n=1}^{\infty} \frac{1}{n}$

(A) None

(B) II only

(C) III only

(D) I and II only

(E) I and III only

5. If $\lim_{b\to\infty} \int_1^b \frac{1}{x^p}\, dx$ is finite, then which of the following must be true?

(A) $\sum_{n=1}^{\infty} \frac{1}{n^p}$ converges

(B) $\sum_{n=1}^{\infty} \frac{1}{n^p}$ diverges

(C) $\sum_{n=1}^{\infty} \frac{1}{n^{p-2}}$ converges

(D) $\sum_{n=1}^{\infty} \frac{1}{n^{p-1}}$ converges

(D) $\sum_{n=1}^{\infty} \frac{1}{n^{p+1}}$

6. If $\sum_{n=0}^{\infty} a_n x^n$ is a Taylor series that converges to f(x) for all real x, then f '(1) =

(A) 0 (B) a_1 (C) $\sum_{n=1}^{\infty} a_n$ (D) $\sum_{n=1}^{\infty} n\, a_n$ (E) $\sum_{n=1}^{\infty} n\, a_n{}^{n-1}$

7. For what integer k, k > 1, will both $\sum_{n=1}^{\infty} \frac{(-1)^{kn}}{n}$ and $\sum_{n=1}^{\infty} \left(\frac{k}{4}\right)^n$ converge?

(A) 6 (B) 5 (C) 4 (D) 3 (E) 2

8. What are all values of x for which the series $\sum_{n=1}^{\infty} \frac{(x+2)^n}{\sqrt{n}}$ converges?

(A) $-3 < x < -1$

(B) $-3 \le x < -1$

(C) $-3 \le x \le -1$

(D) $-1 \le x < 1$

(E) $-1 \le x \le 1$

9. The sum of the infinite geometric series $\frac{2}{5} + \frac{6}{20} + \frac{18}{80} + \frac{54}{320} + \cdots$

(A) $\frac{8}{15}$ (B) $\frac{6}{20}$ (C) $\frac{3}{4}$ (D) $\frac{5}{4}$ (E) $\frac{8}{5}$

10. What are the values of x for which the series $\sum_{n=1}^{\infty} \frac{x^{3n+1}}{(3n+1)!}$ converges?

(A) converges for all x

(B) $|x| < 3$

(C) only at $x = 0$

(D) $|x| < 1$

(E) series diverges for all x

11. Which of the following series converge?

I. $\sum_{n=1}^{\infty} \frac{3}{n}$ II. $\sum_{n=1}^{\infty} \frac{n+1}{n+4}$ III. $\sum_{n=1}^{\infty} \frac{-2}{(-5)^n}$

(A) I only

(B) I and II only

(C) I and III only

(D) II only

(E) III only