14. The sum of the infinite geometric series $\dfrac{3}{2}+\dfrac{9}{16}+\dfrac{27}{128}+\dfrac{81}{1024}+\cdots$ is

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

6. What are all values of p for which $\displaystyle\int_{1}^{\infty}\dfrac{1}{x^{2p}}\,dx$ converges?

A) $p<-1$ B) $p>0$ C) $p>\tfrac{1}{2}$
D) $p>1$ E) There are no values of p for which this integral converges

4. Consider the series $\displaystyle\sum_{n=1}^{\infty}\dfrac{e^{n}}{n!}$. If the ratio test is applied to the series, which of the following inequalities results, implying that the series converges?

A) $\displaystyle\lim_{n\to\infty}\dfrac{e}{n!}<1$ B) $\displaystyle\lim_{n\to\infty}\dfrac{n!}{e}<1$ C) $\displaystyle\lim_{n\to\infty}\dfrac{n+1}{e}<1$

D) $\displaystyle\lim_{n\to\infty}\dfrac{e}{n+1}<1$ E) $\displaystyle\lim_{n\to\infty}\dfrac{e}{(n+1)!}<1$

12. Which of the following series converges for all real numbers of x?

A) $\displaystyle\sum_{n=1}^{\infty}\dfrac{x^{n}}{n}$ B) $\displaystyle\sum_{n=1}^{\infty}\dfrac{x^{n}}{n^{2}}$ C) $\displaystyle\sum_{n=1}^{\infty}\dfrac{x^{n}}{\sqrt{n}}$ D) $\displaystyle\sum_{n=1}^{\infty}\dfrac{e^{n}x^{n}}{n!}$ E) $\displaystyle\sum_{n=1}^{\infty}\dfrac{n!x^{n}}{e^{n}}$

15. What are all values of x for which the series $\displaystyle\sum_{n=1}^{\infty}\left(\dfrac{2}{x^2+1}\right)^n$ converges?

A) $-1 < x < 1$ B) $x > 1$ only   C) $x \geq 1$ only

E) $x < -1$ and $x > 1$ only   F) $x \leq -1$ and $x \geq 1$

79. Le f be a positive, continuous, decreasing function such that $a_n = f(n)$.

If $\displaystyle\sum_{n=1}^{\infty} a_n$ converges to k, which of the following must be true?

A) $\displaystyle\lim_{n\to\infty} a_n = k$

B) $\displaystyle\int_1^n f(x)dx$ diverges

C) $\displaystyle\int_1^{\infty} f(x)dx$ diverges

D) $\displaystyle\int_1^{\infty} f(x)dx$ converges

E) $\displaystyle\int_1^{\infty} f(x)dx = k$

82. If $\displaystyle\sum_{n=1}^{\infty} a_n$ diverges and $0 \leq a_n \leq b_n$ for all n, which of the following statements must be true?

A) $\displaystyle\sum_{n=1}^{\infty}(-1)^n a_n$ converges

B) $\displaystyle\sum_{n=1}^{\infty}(-1)^n b_n$ converges

C) $\displaystyle\sum_{n=1}^{\infty}(-1)^n b_n$ diverges

D) $\displaystyle\sum_{n=1}^{\infty} b_n$ converges

E) $\displaystyle\sum_{n=1}^{\infty} b_n$ diverges

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

(A) $\displaystyle\sum_{n=1}^{\infty}\dfrac{1}{n^p}$ converges   (B) $\displaystyle\sum_{n=1}^{\infty}\dfrac{1}{n^p}$ diverges   (C) $\displaystyle\sum_{n=1}^{\infty}\dfrac{1}{n^{p-2}}$ converges

(D) $\displaystyle\sum_{n=1}^{\infty}\dfrac{1}{n^{p-1}}$ converges   (E) $\displaystyle\sum_{n=1}^{\infty}\dfrac{1}{n^{p+1}}$ diverges

18.   Which of the following series converge?

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

(A) None   (B)   II only   (C) III only   (D) I and II only   (E) I and III only

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

(A) $-3 < x < -1$ (B) $-3 \le x < -1$ (C) $-3 \le x \le -1$ (D) $-1 \le x < 1$ (E) $-1 \le x \le 1$

20.   What are all values of x for which the series $\displaystyle\sum_{n=1}^{\infty} \frac{(x-2)^n}{n3^n}$ converges?

(A) $-3 \le x \le 3$ (B) $-3 < x < 3$ (C) $-1 < x \le 5$ (D) $-1 \le x \le 5$ (E) $-1 \le x < 5$

24.   Which of the following series diverge?

$I. \displaystyle\sum_{n=0}^{\infty} \frac{\sin 2}{\pi}$

$II. \displaystyle\sum_{n=1}^{\infty} \frac{1}{\sqrt[3]{n}}$

$III. \displaystyle\sum_{n=1}^{\infty} \frac{e^n}{e^n + 1}$

A) III only   B) I and II only   C) I and III only
D) II and III only   E) I, II, and III

22.   What are all values of p for which the infinite series $\displaystyle\sum_{n=1}^{\infty} \frac{n}{n^p + 1}$ converges?

A) $p > 0$ B) $p \ge 1$ C) $p > 1$ D) $p \ge 2$ E) $p > 2$