I. Test for convergence/divergence. Name the test you are using.

1. $\sum_{n=0}^{\infty} \frac{1}{2+\sqrt{n}}$

2. $\sum_{n=0}^{\infty} \frac{1}{4n^2-6n+1}$

3. $\sum_{n=0}^{\infty} \left(\frac{2n}{n+1}\right)^n$

4. $\sum_{n=0}^{\infty} \frac{3^n}{(n+1)!}$

5. $\sum_{n=0}^{\infty} \frac{n}{2n^2+1}$

6. $\sum_{n=0}^{\infty} \frac{3^{n+1}}{4^n}$

II. Find the radius of convergence as well as the interval of convergence.

7. $\sum_{n=0}^{\infty} n!\, x^n$

8. $\sum_{n=0}^{\infty} 3(x-2)^n$

9. $\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1)!}$

III. Multiple Choice

Which of the following series are convergent?

I. $1 - \frac{1}{2^2} + \frac{1}{3^2} - \ldots + \frac{1}{n^2} - \ldots$

II. $1 + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} + \ldots + \frac{1}{\sqrt{n}} + \ldots$

III. $\frac{1}{5} + \frac{1}{6} + \frac{1}{7} + \ldots + \frac{1}{n+4} + \ldots$

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

11. The coefficient of x^3 in the Taylor Series for $f(x) = \ln x$ about x is (A) $1/6$ (B) $2/3$ (C) $1/2$ (D) $1/3$ (E) $1/4$

12. What are the values of x for which the series $x - \frac{x^2}{2^2} + \frac{x^3}{3^2} - \frac{x^4}{4^2} + \ldots$ conve
(A) all values of x (B) $0 \le x \le 2$ (C) $0 < x < 2$ (D) $0 < x < 1$ (E) $-1 \le x \le 1$

13. Which of the following series converges

I. $\frac{1}{5} + \frac{1}{10} + \frac{1}{15} + \frac{1}{20} + \ldots + \frac{1}{5n} + \ldots$

II. $\frac{1}{5} + \frac{1}{25} + \frac{1}{125} + \ldots + \frac{1}{5^n} + \ldots$

III. $\frac{1}{5} - \frac{1}{6} + \frac{1}{10} - \frac{1}{11} + \frac{1}{15} - \frac{1}{16} \ldots$

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

14. Given that $\cos x = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{(2n)!}$, what is $\cos(3x^3)$?

(A) $\sum_{n=0}^{\infty} \frac{x^{4n}}{(2n)!}$ (B) $\sum_{n=0}^{\infty} \frac{(-9x)^{2n}}{(2n)!}$ (C) $\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{(2n)!}$

(D) $\sum_{n=0}^{\infty} \frac{-9x^{4n}}{(2n)!}$ (E) $\sum_{n=0}^{\infty} \frac{(-9)^n x^{4n}}{(2n)!}$

15. What are all values of x for which the series $\sum_{n=1}^{\infty} \frac{n3^n}{x^n}$ converges?

(A) All except $x=0$ (B) $|x|=3$ (C) $-3 \le x \le 3$
(D) $|x|>3$ (E) The series diverges for all x

16. The third degree Maclaurin polynomial of $\ln(1-x)$ is

(A) $-x - \frac{x^2}{2} - \frac{x^3}{3}$ (B) $1 - x + \frac{x^2}{2}$ (C) $x - \frac{x^2}{2} + \frac{x^3}{3}$

(D) $-1 + x - \frac{x^2}{2}$ (E) $-x + \frac{x^2}{2} - \frac{x^3}{3}$