Assignment 10-2

Determine whether each of the following infinite series converges or diverges. Show justification and name the test being used. In addition find the sum of the series, if possible.

1. $\sum_{n=0}^{\infty} 5\left(\frac{2}{3}\right)^n$
2. $\sum_{n=1}^{\infty} 5\left(\frac{2}{3}\right)^n$
3. $\sum_{n=0}^{\infty} 5\left(\frac{3}{2}\right)^n$
4. $\sum_{n=1}^{\infty} \frac{n^2+2}{n^2}$
5. $\sum_{n=2}^{\infty} \frac{n^2}{\ln n}$
6. $5+\frac{5}{2}+\frac{5}{4}+\frac{5}{8}+\cdots$
7. $3+\frac{9}{2}+\frac{27}{4}+\frac{81}{8}+\cdots$
8. $1+0.2+0.04+0.008+\cdots$
9. $\sum_{n=1}^{\infty} \frac{n}{\sin n}$
10. $\sum_{n=1}^{\infty} \frac{3^n+2}{3^{n-2}}$
11. $\sum_{n=0}^{\infty} \frac{e^n}{\pi^{n+1}}$
12. $\frac{1}{2}+\frac{2}{4}+\frac{6}{8}+\frac{24}{16}+\frac{120}{32}+\cdots$
13. $\sum_{n=1}^{\infty} \left(\sin e^{10}\right)^n$
14. $\sum_{n=1}^{\infty} \frac{(-5)^n}{6}$
15. $\sum_{n=1}^{\infty} \left(-\frac{5}{6}\right)^n$
16. $18-12+8-\frac{16}{3}+\frac{32}{9}-\cdots$
17. $\sum_{n=1}^{\infty} \frac{2n+3}{3n+2}$
18. $\sum_{n=0}^{\infty} \frac{n!}{e^n}$
19. $\sum_{n=0}^{\infty} \frac{4}{3^n}$
20. $\sum_{n=1}^{\infty} 4^{-n}$

21. Given the series $\sum_{n=1}^{\infty} \frac{n^2+2}{n^3}$:

    a. Find $\lim_{n\to\infty} a_n$.

    b. Explain why the *nth* Term Test **cannot** be used to conclude the series converges.

Evaluate these integrals:

22. $\int_0^{\infty} xe^{-x}\,dx$
23. $\int_0^3 \frac{1}{x-1}\,dx$

Determine the convergence/divergence of the following sequences:

24. $\left\{\left(1+\frac{2}{n}\right)^n\right\}$
25. $\left\{\frac{(n+1)!}{n!}\right\}$

Write an expression for the nth term of the following sequences: (assume $n=1, 2, 3, \cdots$)

26. $3, 7, 11, 15, \cdots$
27. $1, \frac{-1}{2}, \frac{1}{6}, \frac{-1}{24}, \frac{1}{120}, \cdots$
28. $2, 6, 18, 54, \cdots$

Determine whether the following sequences are monotonic and/or bounded: (assume $n=1, 2, 3, \cdots$)

29. $\left\{4-\frac{1}{n}\right\}$
30. $\left\{\cos\frac{n\pi}{2}\right\}$
31. $\left\{\left(\frac{3}{2}\right)^n\right\}$

32. Find the domain, x- and y-intercepts, relative extrema, and points of inflection for $y=\sin x+\cos x$ on $[0,2\pi)$. Then sketch the graph of y without using a calculator.

Differentiate implicitly to find $\frac{dy}{dx}$.

33. $\cos(y-x)=x^3+2$
34. $2xy=\tan y^2$