

Worksheet 2 – Series

Compute the following series

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

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

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

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

5. $\sum_{n=1}^{\infty} \left(\frac{-1}{2}\right)^n$.

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

$$7. \sum_{n=1}^{\infty} \left[\frac{\sin n}{n} - \frac{\sin(n+1)}{n+1} \right].$$

$$8. \sum_{n=0}^{\infty} \left[\frac{2}{5^n} - \left(\frac{2}{7} \right)^n \right].$$

$$9. \sum_{n=3}^{\infty} \frac{1}{3^n}.$$

The following series diverge. Indicate why.

$$10. \sum_{n=1}^{\infty} \frac{1}{2 + \sin n}.$$

$$11. \sum_{n=1}^{\infty} \frac{3^n}{2^n}.$$

$$12. \sum_{n=2}^{\infty} (-1)^n \frac{n}{\ln n}.$$

$$13. \sum_{n=1}^{\infty} \frac{3n}{n^2 - 5}.$$

$$14. \sum_{n=20}^{\infty} \frac{1}{n}.$$

$$15. \sum_{n=1}^{\infty} \frac{\ln n}{\ln(n+1)}.$$

$$16. \sum_{n=1}^{\infty} \frac{n!}{20^n}.$$

$$17. \sum_{n=1}^{\infty} \frac{n^n}{n!}.$$

$$18. \sum_{n=1}^{\infty} \frac{1}{\sqrt[3]{n}}.$$

$$19. \sum_{n=1}^{\infty} (-1)^n \frac{e^n}{n^{10}}.$$

The following series converge. Indicate why. Also indicate whether the convergence is Absolute or Conditional.

$$20. \sum_{n=1}^{\infty} (-1)^n \frac{1}{n}.$$

$$21. \sum_{n=1}^{\infty} (-1)^n \frac{1}{\sqrt[3]{n}}.$$

$$22. \sum_{n=1}^{\infty} \left(\frac{2}{3}\right)^n.$$

$$23. \sum_{n=0}^{\infty} \frac{2^n}{n!}.$$

$$24. \sum_{n=1}^{\infty} \frac{\sin n}{n^2}.$$

$$25. \sum_{n=1}^{\infty} \frac{2n + 5}{n^3 + 6n - 5}.$$

$$26. \sum_{n=2}^{\infty} (-1)^n \frac{\ln n}{\sqrt{n}}.$$

$$27. \sum_{n=0}^{\infty} (-1)^n \frac{1}{n!}.$$

$$28. \sum_{n=1}^{\infty} \frac{n!}{n^n}.$$

$$29. \sum_{n=1}^{\infty} (-1)^{n-1} \frac{n}{(n+1) \ln n}.$$

$$30. \sum_{n=1}^{\infty} \frac{1}{\sqrt{n^3 + 3n}}.$$

$$31. \sum_{n=1}^{\infty} (-1)^n \frac{1}{\ln n + 1}.$$

Determine the convergence or divergence of the following series. Indicate clearly the test or tests used in the analysis.

$$32. \sum_{n=1}^{\infty} \frac{1}{(0.7)^n}.$$

$$33. \sum_{n=1}^{\infty} (-1)^n \frac{2^n}{n!}.$$

$$34. \sum_{n=2}^{\infty} \frac{n+3}{n^3-5}.$$

$$35. \sum_{n=1}^{\infty} \frac{2n+7}{n^2+n}.$$

$$36. \sum_{n=1}^{\infty} \frac{\ln n}{n^2}.$$

$$37. \sum_{n=1}^{\infty} \frac{n^{2n}}{(2n)^n}.$$

$$38. \sum_{n=1}^{\infty} \frac{n \ln n}{n^2 + 5}.$$

$$39. \sum_{n=0}^{\infty} \left(\frac{-1}{3}\right)^n.$$

$$40. \sum_{n=10}^{\infty} \frac{2 + \frac{1}{n}}{3^n}.$$