Series

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Exercises

For each of the following series, determine whether the series converges or diverges. If the series converges find its limiting value.

I. $\frac{1}{4} + \frac{2}{4} + \frac{2^2}{4} + \frac{2^3}{4} + \cdots$

II. $2 + \frac{2}{5} + \frac{2}{5^2} + \frac{2}{5^3} + \cdots$

III. $\frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \frac{1}{4 \cdot 5} + \frac{1}{5 \cdot 6} + \cdots$

Use direct or limit comparison tests to determine if the following series converge or diverge.

IV. $\sum_{k=1}^{\infty} \frac{1}{2 + 3^k}$

V. $\sum_{k=1}^{\infty} \frac{\sqrt{k}}{k^2 + 1}$

Use ratio or root tests to determine if the following series converge or diverge.

VI. $\sum_{k=1}^{\infty} \frac{(2k)!}{4^k}$

VII. $\sum_{k=1}^{\infty} \left(\frac{1}{\ln(k+1)} \right)^k$

Use the alternating series test to determine if the following series converge or diverge. If the series converges, determine if the convergence is absolute or conditional.

VIII. $\sum_{k=1}^{\infty} (-1)^{k+1} \frac{2^k}{k!}$

IX. $\sum_{k=1}^{\infty} (-1)^k \frac{1}{k}$

X. Bonus: Describe a rearrangement of the alternating harmonic series that converges to 0.