The Ratio and Root Tests: Examples

1. Use the Ratio Test to test the series for convergence: $\displaystyle\sum_{n=1}^{\infty} \frac{n^2 2^n}{n!}$

2. Use the Ratio Test to test the series for convergence: $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n n^5}{5^n}$

3. Use the Ratio Test to test the series for convergence: $\displaystyle\sum_{n=1}^{\infty} \frac{(n+2)^2 3^n}{(2n)!}$

4. Use the Ratio Test to test the series for convergence: $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n-1}(n+4)}{4^n}$

5. Use the Ratio Test to test the series for convergence: $\displaystyle\sum_{n=1}^{\infty} \frac{(2n)!}{200^n}$

6. Use the Ratio Test to test the series for convergence: $\displaystyle \frac{3}{5} + \frac{3 \cdot 7}{5 \cdot 8} + \frac{3 \cdot 7 \cdot 11}{5 \cdot 8 \cdot 11} + \cdots$

7. Use the Root Test to test the series for convergence: $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n n^5}{5^n}$

8. Use the Root Test to test the series for convergence: $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n-1}(n+4)}{4^n}$

9. Use the Root Test to test the series for convergence: $\displaystyle\sum_{n=1}^{\infty} \left(1 - \frac{2}{n}\right)^{n^2}$

10. Use the Root Test to test the series for convergence: $\displaystyle\sum_{n=1}^{\infty} \frac{(-3)^n}{(n!)^{2n}}$

11. Use the Root Test to test the series for convergence: $\displaystyle\sum_{n=1}^{\infty} \left(\frac{-5n}{6n+5}\right)^{7n}$

12. Use the Root Test to test the series for convergence: $\displaystyle\sum_{n=1}^{\infty} (\csc^{-1} n)^n$