Example: The Ratio Test

Determine whether the series $\sum_{n=0}^{\infty} \frac{2^n}{n!}$ converges or diverges.

The Ratio Test

To determine the radius of convergence of a power series with general term u_n, use the Ratio Test.

- If $\lim_{n\to\infty} \left| \frac{u_{n+1}}{u_n} \right| = \infty$, the series converges only at its center, so its radius of convergence is $R = 0$.
- If $\lim_{n\to\infty} \left| \frac{u_{n+1}}{u_n} \right| = 0$, the series converges for all x, so its radius of convergence is $R = \infty$.
- Otherwise, set $\lim_{n\to\infty} \left| \frac{u_{n+1}}{u_n} \right| < 1$. Rewrite this inequality in the format $|x - c| < R$, where R is the series' radius of convergence.

Example: The Ratio Test

Find the radius of convergence of $\sum_{n=0}^{\infty} n! x^n$.

Example: The Ratio Test

Find the radius of convergence of $\sum_{n=1}^{\infty} \frac{n \cdot x^n}{4^n}$.

Example: The Ratio Test

Find the radius of convergence of $\sum_{n=0}^{\infty} \frac{(x-1)^{3n}}{(3n)!}$.