Example

Find the interval of convergence for the series

\[ \sum_{k=1}^{\infty} (-1)^k (3x - 5)^k. \]

Do not check convergence at the endpoints of intervals.

We first compute

\[
\bar{\lambda} = \lim_{k \to \infty} \left| \frac{a_{k+1}}{a_k} \right| \\
= \lim_{k \to \infty} \left| \frac{(-1)^{k+1}(3x - 5)^{k+1}}{(-1)^k(3x - 5)^k} \right| \\
= \lim_{k \to \infty} \left| (-1)(3x - 5) \right| \\
= |3x - 5|,
\]

and then determine the values of \( x \) for which \( \bar{\lambda} < 1 \). It follows that

\[ |3x - 5| < 1 \iff -1 < 3x - 5 < 1 \iff \frac{4}{3} < x < \frac{6}{3}, \]

thus the series converges on the interval \( \left( \frac{4}{3}, 2 \right) \).