Homework 9

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11.5 Question 7

Test the series for convergence or divergence.

$$\sum_{n=1}^{\infty} = (-1)^n \frac{3n-1}{2n+1}$$

Solution

Leibnitz rule for alternating series tells us that the series will converge if the series is monotonically decreasing towards zero then the series is convergent. We can find the limit relatively easily;

$$\begin{aligned}\lim_{n\to\infty} \frac{3n-1}{2n+1} &= \lim_{n\to\infty} \frac{n\left(3-\frac{1}{n}\right)}{n\left(2+\frac{1}{n}\right)} \\ &= \lim_{n\to\infty} \frac{\left(3-\frac{1}{n}\right)}{\left(2+\frac{1}{n}\right)} \\ &= \frac{3}{2}\end{aligned}$$

By Leibnitz rule, the series does not converge because it does not approach zero in the limit.