

## Problem 6

Use the preliminary test to decide whether the following series are divergent or require further testing. *Careful:* Do *not* say that a series is convergent; the preliminary test cannot decide this.

$$\sum_{n=1}^{\infty} \frac{n!}{(n+1)!}$$

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### Solution

Take the limit of the summand as  $n \rightarrow \infty$ .

$$\begin{aligned} \lim_{n \rightarrow \infty} \frac{n!}{(n+1)!} &= \lim_{n \rightarrow \infty} \frac{n!}{(n+1)n!} \\ &= \lim_{n \rightarrow \infty} \frac{1}{n+1} \\ &= 0 \end{aligned}$$

Since it's zero, no conclusion can be drawn. Further testing is needed.