

WRITE YOUR NAME:

MAC 2312 Quiz 19
Tuesday April 2nd

Determine whether the series converges or diverges.

$$\sum_{n=0}^{\infty} \frac{1}{n!}$$

Easiest method might be RATIO TEST.

$$\begin{aligned} a_n &= \frac{1}{n!} & a_{n+1} &= \frac{1}{(n+1)!} & \lim_{n \rightarrow \infty} \left| \frac{a_{n+1}}{a_n} \right| &= \lim_{n \rightarrow \infty} \frac{a_{n+1}}{a_n} \\ & & & & = \lim_{n \rightarrow \infty} \left(\frac{1}{(n+1)!} \div \frac{1}{n!} \right) &= \lim_{n \rightarrow \infty} \left(\frac{1}{(n+1)!} \cdot \frac{n!}{1} \right) \\ & & & & = \lim_{n \rightarrow \infty} \frac{n!}{(n+1)!} &= \lim_{n \rightarrow \infty} \frac{1 \cdot 2 \cdot 3 \cdots n}{1 \cdot 2 \cdot 3 \cdots n \cdot (n+1)} = \lim_{n \rightarrow \infty} \frac{1}{n+1} \\ & & & & = \frac{1}{\infty} &= 0 \text{ which is } < 1, \text{ so series CONVERGES by ratio test} \end{aligned}$$

Another possibility is DIRECT COMPARISON. We can say
 $n! > n^2$ or $n! > 2^n$