QUESTION

Determine whether the series $\sum_{k=0}^{\infty} \dfrac{3^k}{k!}$ is convergent.

ANSWER

$$\sum_{k=0}^{\infty} \frac{3^k}{k!},$$

$$u_k = \frac{3^k}{k!}$$

$$\frac{u_{k+1}}{u_k} = \frac{3^{k+1}}{(k+1)!}\frac{k!}{3^k} = \frac{3}{k+1} = \frac{\frac{3}{k}}{1+\frac{1}{k}} \to \frac{0}{1} = 0 \text{ as } k \to \infty$$

Therefore the limit < 1 so the series is convergent.