

Problem 5

In the following problems, find the limit of the given sequence as $n \rightarrow \infty$.

$$\frac{10^n}{n!}$$

Solution

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

$$\begin{aligned}\lim_{n \rightarrow \infty} \frac{10^n}{n!} &= \lim_{n \rightarrow \infty} \frac{\overbrace{10 \cdot 10 \cdot 10 \cdots 10 \cdot 10 \cdot 10}^n}{n(n-1)(n-2) \cdots 3 \cdot 2 \cdot 1} \\ &= \left(\lim_{n \rightarrow \infty} \frac{10}{n} \right) \left(\lim_{n \rightarrow \infty} \frac{10}{n-1} \right) \left(\lim_{n \rightarrow \infty} \frac{10}{n-2} \right) \cdots \left(\lim_{n \rightarrow \infty} \frac{10}{3} \right) \left(\lim_{n \rightarrow \infty} \frac{10}{2} \right) \left(\lim_{n \rightarrow \infty} \frac{10}{1} \right) \\ &= (0)(0)(0) \cdots \left(\frac{10}{3} \right) \left(\frac{10}{2} \right) \left(\frac{10}{1} \right) \\ &= 0\end{aligned}$$