[6 points] Determine if the following series converges or diverges, and circle the corresponding word.
Fully justify your answer including using proper notation and showing mechanics of any tests you use.



Justification:

Circle one:

Solution:~ We use the Ratio Test to determine whether the given series converges or diverges. First, we form

$$\frac{a_{n+1}|}{|a_n|} = \frac{\frac{4^{n+1}}{(n+1)!}}{\frac{4^n}{n!}} = \frac{4^{n+1}}{4^n} \cdot \frac{n!}{(n+1)!} = \frac{4}{n+1}.$$

Thus

$$\lim_{n \to \infty} \frac{|a_{n+1}|}{|a_n|} = \lim_{n \to \infty} \frac{4}{n+1} = 0 < 1.$$

Hence, the series  $\sum_{n=1}^{\infty} \frac{4^n}{n!}$  converges by the Ratio test.