Does the series $\sum\limits_{n=1}^{\infty} (-1)^n \frac{n^n}{n!}$ converge? **Justify your answer very thoroughly.**

Answer. Let a_n be the nth individual term of this series. That is $a_n = (-1)^n \frac{n^n}{n!}$. We see that $|a_n| = \frac{n^n}{n!} = \frac{n}{n}\frac{n}{n-1}\frac{n}{n-2}\ldots\frac{n}{2}\frac{n}{1} \geq 1$. Thus, $\lim\limits_{n\to\infty} a_n \neq 0$. The Individual Term Test for Divergence tells us that $\sum\limits_{n=1}^{\infty} (-1)^n \frac{n^n}{n!}$ diverges.