$$n(n+1)(n+2) > n^3$$

$$\Rightarrow \frac{1}{n^3} > \frac{1}{n(n+1)(n+2)}$$

$$0 < \frac{n! \ln n}{n(n+2)!} = \frac{\ln n}{n(n+1)(n+2)} \leq \frac{\ln n}{n^3}$$

$$< \frac{1}{n^2}$$, convergent by direct comparison