1. In the worksheets done in class we showed that for all $x \in \mathbb{R}$, $e^x \in \mathbb{R}$ and is given by

$$e^x = 1 + \sum_{k=1}^{\infty} \frac{x^k}{k!}.$$

(a) For $x \in \mathbb{R}$, write down the definition of

$$\sum_{k=1}^{\infty} \frac{x^k}{k!}.$$

(b) Show that for $x > 0, n \in \mathbb{N}$,

$$0 \leq \frac{x^n}{e^x} \leq \frac{x}{(n+1)!}$$

(c) Using (b), show that[1] $\lim_{n\to\infty} x^n e^{-x} = 0$

[1] If you are not proving from first principles and you are using a result then: please state it clearly; and describe how you are applying it.