1. What is this called: \( \lim_{n \to \infty} (1 + \frac{1}{n})^n \)?

2. What is this: \( \lim_{n \to \infty} (1 + \frac{x}{n})^n \)? (assume \( x \) is a constant)

3. Let \( 0 < x < 1 \).
   
   (a) What is bigger, \( 1 + x \) or \( e^x \)?
   
   (b) What is bigger, \( 1 - x \) or \( e^{-x} \)?

   [Hint: Think about the Taylor Series Expansion around 0.]

4. What is a good approximation for:
   
   (a) \( S = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \cdots + \frac{1}{n} \) (give both an upper and lower bound)
   
   (b) \( S = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \cdots \)