

$$k! \geq \left(\frac{k}{e}\right)^k \quad (1)$$

$$e^k = 1 + \frac{k}{1!} + \frac{k^2}{2!} + \frac{k^3}{3!} + \frac{k^4}{4!} + \dots + \frac{k^k}{k!} + \dots \quad (2)$$

$$k!e^k = k!(1 + \frac{k}{1!} + \frac{k^2}{2!} + \frac{k^3}{3!} + \frac{k^4}{4!} + \dots + \frac{k^k}{k!} + \dots) \quad (3)$$

$$k!e^k = k! + k!\frac{k}{1!} + k!\frac{k^2}{2!} + k!\frac{k^3}{3!} + k!\frac{k^4}{4!} + \dots + k!\frac{k^k}{k!} + \dots \quad (4)$$

$$k!e^k = k! + k!\frac{k}{1!} + k!\frac{k^2}{2!} + k!\frac{k^3}{3!} + k!\frac{k^4}{4!} + \dots + k^k + \dots \quad (5)$$

$$k!e^k = k^k + \Delta \quad (6)$$

$$k!e^k \geq k^k \quad (7)$$

$$k! \geq \frac{k^k}{e^k} \quad (8)$$

$$k! \geq \left(\frac{k}{e}\right)^k \quad (9)$$

$$\binom{n}{k} \quad (10)$$