$$\frac{n^n}{e^{(n-1)}} \leq n! \leq \frac{n \times n^n}{e^{(n-1)}} \tag{1}$$

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6} \tag{2}$$

$$\sum_{i=1}^{n} i^3 = \left(\frac{n(n+1)}{2}\right)^2 \tag{3}$$

$$\sum_{i=1}^{n} i^4 = \frac{n}{30}\left(6n^4 + 15n^3 + 10n^2 - 1\right) \tag{4}$$

$$\sum_{i=1}^{n} i^5 = \frac{n^2}{12}\left(2n^4 + 6n^3 + 5n^2 - 1\right) \tag{5}$$