

Exercise (E)

Problem 10 Show that if $X_1, X_2, \dots, X_n \stackrel{iid}{\sim} B(1, p)$,
 $\lambda = np$ and $S_n = \sum_{i=1}^n X_i$. Then

$$P(S_n \geq t + \varepsilon S_n) \leq \left(\frac{\lambda}{\lambda+t}\right)^{\lambda+t} \left(\frac{n-\lambda}{n-\lambda-t}\right)^{n-\lambda-t},$$

for any $0 \leq t \leq n - \lambda$.

Problem 11 Show that $(1-\varepsilon)^{1-\varepsilon} \geq e^{-\varepsilon + \frac{\varepsilon^2}{2}}$
and $(1+\varepsilon)^{1+\varepsilon} \geq e^{\varepsilon + \frac{\varepsilon^2}{3}}$, for any $0 < \varepsilon < 1$.