1. The Neyman-Pearson Lemma.
You want to find the set \( A \) which provides a maximum of \( P(A) \) subject to \( Q^*(A) \leq \alpha \). State the result, and prove it. You can assume that \( P \) and \( Q^* \) are equivalent.

2. Quantile hedging the down-and-in option.
We assume the geometric Brownian motion model (3.1) in the paper, and set

\[
H = (X_T - K)^+ I(\min_{0 \leq t \leq T} X_t \leq B)
\]

Find the value \( \tilde{V}_0 \) that minimizes the starting value for a self financing strategy which covers \( H \) with probability \( 1 - \epsilon \). For \( \epsilon = 5\% \), \( B = 98 \), and other values given on p. 261 of the paper, find the numerical value for \( V_0/H_0 \).