1. Define the following notions:
   (a) sufficient statistic;
   (b) ancillary statistic;
   (c) Fisher information;
   (d) complete statistic.

2. Let \( Y_1, \ldots, Y_n \) be independent and identically distributed random variables with the same density \( f(y; \theta) \). Show that the order statistics are sufficient for \( \theta \).

3. If the random variables \( Y_1, \ldots, Y_n \) are independent \( N(0, \sigma^2) \), find a sufficient statistic for \( \sigma^2 \).

4. State and demonstrate the factorization criterion for a sufficient statistic.

5. What are the sufficient statistics for an exponential model? Are these statistics minimal? Justify your answers.

6. Let \( \ell(Y; \theta) \) be the likelihood function for the sample \( Y = (Y_1, \ldots, Y_n)' \). Show that
   \[
   I(\theta) = E \left[ -\frac{\partial^2 \log \ell(Y; \theta)}{\partial \theta \partial \theta'} \right].
   \]

7. When is parameter
   (a) identifiable?
   (b) locally identifiable?

8. When is a parametric model identifiable?
References