1. For a given \( n \), let \( j \) be the greatest integer \( \leq n/4 \) and let \( k \) be the smallest integer \( \geq 3n/4 \). Then one possible definition of the \textit{interquartile range} is \( X(k) - X(j) \). Find the breakdown point of this statistic, and its limit as \( n \to \infty \).

2. Randles and Wolfe p. 246 Problem 7.4.1 (show that the inequality holds for all \( \theta \)).


4. In the handout “Breakdown points of 1-dimensional location M-estimators”, it is stated that if \( k \) is an integer \( \geq n/2 \), then given \( X_1, \ldots, X_n \), there exist \( Y_1, \ldots, Y_n \) with \( Y_i = X_i \) for \( n - k \) values of \( i \) while \( Y_1, \ldots, Y_n \) are symmetrically distributed around an arbitrarily large median, which is then the M-estimator. Prove these statements in detail.

5. Consider the data set \( 0, 1, 2, 2, 4.5, 5.6, 8.9 \).
   
   (a) Find the breakdown point of \( 1/S \) at this data set, where \( S \) is \( S^* \) as defined in R&W, (7.4.16).

   (b) Compare the breakdown point of the M-estimator (which uses \( S = S^* \)) to that of \( 1/S \).