Problem 1. Let \( \{a_n\} \) be a sequence of real numbers. We may also claim that \( \{a_n\} \) is a sequence of constant (degenerate) random variables. Let \( a \) be a real number. Show that the convergence of the sequence \( a_n \) to \( a \) is equivalent to convergence of the corresponding degenerate random variables to the same limit in probability.

Problem 2. Let \( W_n \) denote a random variable with mean \( \mu \) and variance \( \sigma^2 \), where \( p > 0 \), \( \mu \), and \( b \) are constants independent on \( n \). Prove that \( W_n \) converges in probability to \( \mu \).

Problem 3. Prove that almost sure convergence of a sequence of random variables \( X_n, n = 1, 2, \ldots \) to a constant \( \mu \) is equivalent to the requirement that for every \( \epsilon > 0 \),

\[
\lim_{n \to \infty} P\{\sup_{k \geq n} |X_k - \mu| \geq \epsilon\} = 0.
\]

Also, show that

\[
\sum_{n=1}^{\infty} P\{|X_n - \mu| \geq \epsilon\} < \infty
\]

implies almost sure convergence.

Problem 4. Problems 2.11, 2.13, 2.15, 2.19 from the text.