Definition 1 (Convergence in Probability)**.** *Given a sequence of random variables X_n. We say X_n convergence to a random variable X in probability if and only if $\forall \epsilon > 0$*

$$P(|X_n - X| > \epsilon) \to 0.$$

Definition 2. *Convergence in Distribution Given a sequence of random variables X_n. We say X_n convergence to a random variable X in distribution if and only if PDF/PMF/CDF of X_n convergence to PDF/PMF/CDF of X.*

Problem 1. *Let $U_1, \ldots, U_n$ be random variables. U_n has distribution Exp(n). Claim U_n convergence to 0 in probability.*

Problem 2. *Let $U_1, \ldots, U_n$ be independent Unif(0,1) random variables, $X_{(n)} := \max\{U_1, \ldots, U_n\}$. Prove that $n(1 - X_{(n)})$ convergence in distribution to Exp(1).*

Problem 3. *Let $X_1, \ldots, X_{100}$ be independent Possion(1) random variables. Use normal approximation to approximate the probability that $\sum_{i=1}^{100} X_i$ is between 90 and 110.*