1. Solve the following problems from your text book:
   a) 4-1
   b) 4-9
   c) 4-13

2. Let \( f(x) = \begin{cases} 
\frac{1}{2} \lambda e^{-\lambda x} & x > 0 \\
\frac{1}{2} \lambda e^{\lambda x} & x < 0 
\end{cases} \) be probability distribution function of random variable \( X \). Find probability distribution of \(|X|\)?

3. Assume that a fair coin is tossed \( n \) times. Defining \( Y_n = |H| - |T| \) (Number of heads minus number of tails), find probability distribution function and mean of \( Y_n \).

4. We name the number \( \mu \) as median of Random Variable \( X \), if and only if we have \( P(X \leq \mu) \geq \frac{1}{2} \land P(X \geq \mu) \geq \frac{1}{2} \). Prove that such a number always exists but not necessarily unique.

5. Prove that if we have two Random Variables \( X, Y \) such that for all outcomes \( t \in S \), \( X(t) < Y(t) \) then for all values of \( w \), we will have \( F_x(w) \geq F_y(w) \).

6. Consider distribution function \( f(x) \) such that \( \forall x \leq 0 \ f(x) = 0 \). Assume that there is a constant \( \lambda > 0 \) such that \( \forall t > 0 \lim_{h \to 0} \frac{P(x \in (t, t+h) | x \in (t, \infty))}{h} = \frac{\lambda}{\lambda} \). Show that \( f(x) = \frac{1}{\lambda} e^{-\frac{1}{\lambda} x} \) for all \( x > 0 \).

7. * Players A and B are playing a game, on each turn a coin is tossed, if head, A gives B one dollar and if tail B gives A one dollar. Initially, A has a dollars and B has b dollars. What is the probability that A wins all the money from B? (The coin is not necessarily fair)

* This Problem is not relevant to random variables.