CSE 107
Homework Assignment 7

Section 3.5: Conditioning

1. Let X have a uniform distribution in the unit interval $[0, 1]$, and let Y have an exponential distribution with parameter $\nu = 2$. Assume that X and Y are independent, and let $Z = X + Y$.

   a. Find $P(Y \geq X)$.
   b. Find the conditional PDF of Z given that $Y = y$.
   c. Find the conditional PDF of Y given that $Z = 3$.

Section 4.1: Derived Distributions

2. Let X be a random variable with PDF $f_X(x)$. Find the PDF of the random variable $Y = |X|$ in the following three cases.
   a. X is exponentially distributed with parameter λ.
   b. X is uniformly distributed in the interval $[-1, 2]$.
   c. $f_X(x)$ is a general PDF.

3. Let X and Y be independent discrete random variables with the same PMF:

$$p_X(x) = \begin{cases} 1/4 & \text{if } x = 1 \\ 1/4 & \text{if } x = 2 \\ 1/2 & \text{if } x = 3 \\ 0 & \text{otherwise} \end{cases}$$

   and similarly for Y. Use the convolution product to find the PMF of $Z = X + Y$.

4. Let X be continuous uniform on the interval $[0, 2]$, and Y continuous uniform on $[3, 4]$. Assume that X and Y are independent. Use the convolution product to find the PDF of $Z = X + Y$.