ECS 315: In-Class Exercise # 13 - Sol

Instructions

1. Separate into groups of no more than three students each. **The group cannot be the same as any of your former groups after the midterm.**
2. [ENRE] Explanation is not required for this exercise.
3. **Do not panic.**

Date: 15/10/2019			
Name	ID (last 3 digits)		
Prapun	5	5	5

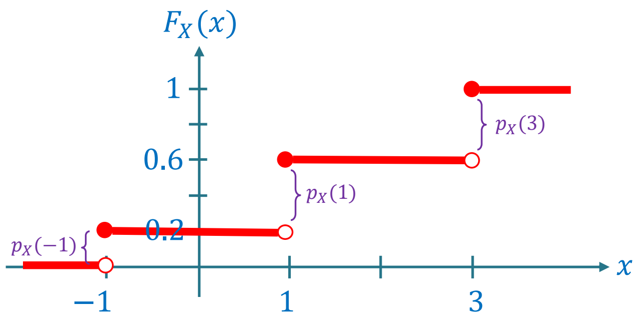
1. Consider a random variable X whose pmf is given by

$$p_X(x) = \begin{cases} 0.2, & x = -1, \\ c, & x = 1, 3, \\ 0, & \text{otherwise.} \end{cases}$$

a. Find the constant c.

$$\text{“}\Sigma = 1\text{”} \Rightarrow p_X(-1) + p_X(1) + p_X(3) = 1$$
$$0.2 + c + c = 1$$
$$c = 0.4$$

b. Plot the cdf of this random variable.



Recall that the cdf can be derived from the pmf by using the $p_X(x)$ as the jump amount at x.

2. Consider a random variable X whose cdf is given by

$$F_X(x) = \begin{cases} 0, & x < 0, \\ 0.2, & 0 \le x < 3, \\ 1, & x \ge 3. \end{cases}$$

At $x = 0$, there is a jump of size 0.2.
At $x = 3$, there is a jump of size 0.8.

a. Find $P[X \le 1]$.

By definition, $P[X \le 1] = F_X(1) = 0.2$.

b. Find $P[X > 1]$.

Because $[X > 1]$ and $[X \le 1]$ are opposite (complementary) events, we know that

$$P[X > 1] = 1 - P[X \le 1] = 1 - 0.2 = 0.8.$$

c. Plot the pmf of X.

For discrete RV, the pmf can be derived from the jump amounts in the cdf plot.
Here, the jumps in the cdf happen twice: at $x = 0$ and $x = 3$.
The jump amounts are 0.2 and 0.8, respectively.

Therefore, $p_X(x) = \begin{cases} 0.2, & x = 0, \\ 0.8, & x = \cancel{2}, 3 \\ 0, & \text{otherwise.} \end{cases}$