EES 315: In-Class Exercise # 16

Instructions

1. Work alone or in a group of no more than three students. **The group cannot be the same as any of your former groups after the midterm.**
2. Only one submission is needed for each group.
3. You have two choices for submission:
   (a) Online submission via Google Classroom
   - PDF only.
   - Only for those who can directly work on the posted files using devices with pen input.
   - Paper size should be the same as the posted file.
   - No scanned work, photos, or screen capture.
   - Your file name should start with the 10-digit student ID of one member.
     (You may add the IDs of other members, exercise #, or other information as well.)

   (b) Hardcopy submission
4. **Do not panic.**

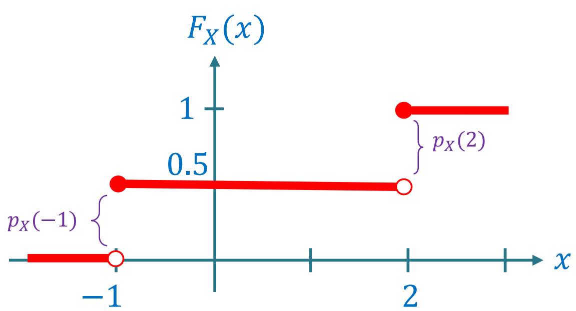
Date: 30 / 10 / 2020			
Name	ID (last 3 digits)		

1. Consider a random variable X whose pmf is given by $p_X(x) = \begin{cases} c, & x = -1, 2, \\ 0, & \text{otherwise.} \end{cases}$

   a. Find the constant c.

   "$\Sigma = 1$" $\Rightarrow p_X(-1) + p_X(2) = 1 \Rightarrow c + c = 1 \Rightarrow c = 0.5$

   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

$$F_X(x) = \begin{cases} 0, & x < 0, \\ 0.2, & 0 \le x < 2, \\ 0.6, & 2 \le x < 4, \\ 1, & x \ge 4. \end{cases}$$

At $x = -1$, there is a jump of size 0.2.
At $x = 2$, there is a jump of size 0.4.
At $x = 4$, there is a jump of size 0.4.

   a. Find $P[X \le 3]$.

   By definition, $P[X \le 3] = F_X(3)$. Because $2 \le 3 < 4$, we have $F_X(3) = 0.6$.

   b. Find $P[X > 3]$.

   Because $[X > 3]$ and $[X \le 3]$ are opposite (complementary) events, we know that

$$P[X > 3] = 1 - P[X \le 3] = 1 - 0.6 = 0.4.$$

   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 three times: at $x = 0$, $x = 2$, and $x = 4$.
   The jump amounts are 0.2, 0.4, and 0.4, respectively.

   Therefore, $p_X(x) = \begin{cases} 0.2, & x = 0, \\ 0.4, & x = 2, \\ 0.4, & x = 4, \\ 0, & \text{otherwise.} \end{cases}$