EES 315: In-Class Exercise # 21

Date: 17 / 11 / 2020			
Name	ID (last 3 digits)		

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.**

In this question, we consider two distributions for a random variable X.
In part (a), which corresponds to the second column in the table below, X is a ***discrete*** random variable with its pmf specified in the first row.
In part (b), which corresponds to the third column, X is a ***continuous*** random variable with its pdf specified in the first row.

	$p_X(x) = \begin{cases} cx^3, & x \in \{1,2\}, \\ 0, & \text{otherwise.} \end{cases}$	$f_X(x) = \begin{cases} cx^3, & x \in [1,2), \\ 0, & \text{otherwise.} \end{cases}$
Find c	"$\Sigma = 1$": $p_X(1) + p_X(2) = 1$ $c(1)^3 + c(2)^3 = 1$ $9c = 1$ $c = \frac{1}{9}$. x | $p_X(x)$ 1 | $c(1)^3 = c = \frac{1}{9}$ 2 | $c(2)^3 = 8c = \frac{8}{9}$	We need "$\int = 1$". $\int_{-\infty}^{\infty} f_X(x)dx = \int_1^2 f_X(x)dx$ $= \int_1^2 cx^3 dx = \frac{cx^4}{4}\Big\|_1^2$ $= \frac{c}{4}(2^4 - 1^4) = \frac{15}{4}c$ Therefore, $\frac{15}{4}c = 1$ $c = \frac{4}{15}$.
Find $P[0 < X \le 1]$	The possible values of this RV are 1 and 2. Among these, only "1" satisfies the condition. Therefore, $P[0 < X \le 1] = P[X = 1]$ $= p_X(1) = \frac{1}{9}$.	$f_X(x) = 0$ inside this interval $P[0 < X \le 1] = \int_0^1 f_X(x)dx = \int_0^1 \cancel{cx^3}\, dx$ $\cancel{= \frac{cx^4}{4}\Big\|_0^1 = \frac{c}{4}(1^4 - 0^4)}$ $\cancel{= \frac{c}{4} = \frac{1}{15}}$. $= 0$