PROBABILITY

DIVYA SAI - FWC22094

16.4.10 [1] The random variable X has a probability distribution $\Pr(X)$ of the following form.Where k is some number:

$$\Pr(X) = \begin{cases} k, & \text{if x=0} \\ 2k, & \text{if x=1} \\ 3k, & \text{if x=2} \\ 0, & \text{otherwise} \end{cases} \qquad (16.4.10.1)$$

a) Determine the value of k

b) Find $\Pr(X < 2)$,$\Pr(X \leq 2)$,$\Pr(X \geq 2)$

Solution:
we know that, Sum of Probabilities $= 1$.

$$k + 2k + 3k = 1 \qquad (16.4.10.2)$$
$$6k = 1 \qquad (16.4.10.3)$$
$$k = \frac{1}{6} \qquad (16.4.10.4)$$

Using CDF,

$$F(x) = \begin{cases} 0, & \text{if x<0} \\ \frac{1}{6}, & \text{if } 0 \leq \text{x} < 1 \\ \frac{1}{2}, & \text{if } 1 \leq \text{x} < 2 \\ 1, & \text{x} \geq 2 \end{cases} \qquad (16.4.10.5)$$

(a) P(X < 2)

$$\sum_{k=0}^{1} \Pr(X = k) = \Pr(X \geq 2) \qquad (16.4.1.6)$$
$$\Pr(0 < X \leq 1) \qquad (16.4.1.7)$$
$$= F(1) \qquad (16.4.1.8)$$
$$= \frac{1}{2} \qquad (16.4.1.9)$$

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[1]Read question numbers as (CHAPTER NUMBER).(EXERCISE NUMBER).(QUESTION NUMBER)

(b) P(X $\leq$ 2)

$$\sum_{k=0}^{2} \Pr\left(X = k\right) = \Pr\left(X \leq 2\right) \qquad (16.4.2.10)$$

$$= F(2) \qquad (16.4.2.11)$$

$$= 1 \qquad (16.4.2.12)$$

(c) P(X $\geq$ 2)

$$\Pr\left(1 < X \leq 2\right) \qquad (16.4.3.13)$$

$$= F(2) - F(1) \qquad (16.4.3.14)$$

$$= 1 - \frac{1}{2} \qquad (16.4.3.15)$$

$$= \frac{1}{2} \qquad (16.4.3.16)$$