

Name:
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Quiz #3

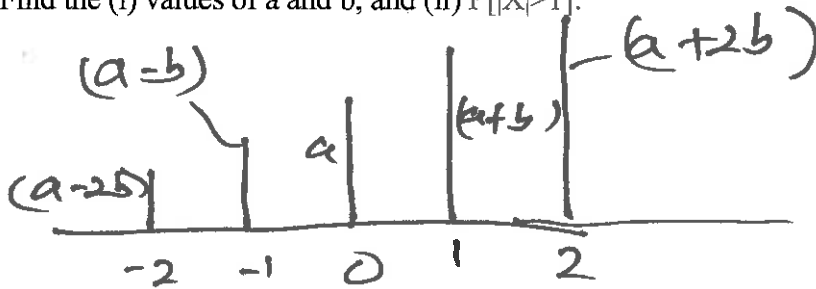
10/07/15

[1] The probability mass function of a discrete random variable is given by

$$P_X(x) = \begin{cases} (a+bx), & x = -2, -1, 0, 1, 2 \\ 0, & \text{otherwise} \end{cases}$$

where, a and b are constants. It is known that $P[X>0] - P[X<0] = 0.2$

Find the (i) values of a and b , and (ii) $P[|X|>1]$.



$$(a-2b) + (a-b) + a + (a+b) + (a+2b) = 1$$

$$5a = 1 \rightarrow a = \frac{1}{5}$$

$$(a+b) + (a+2b) - [(a-b) + (a-2b)] = 0.2$$

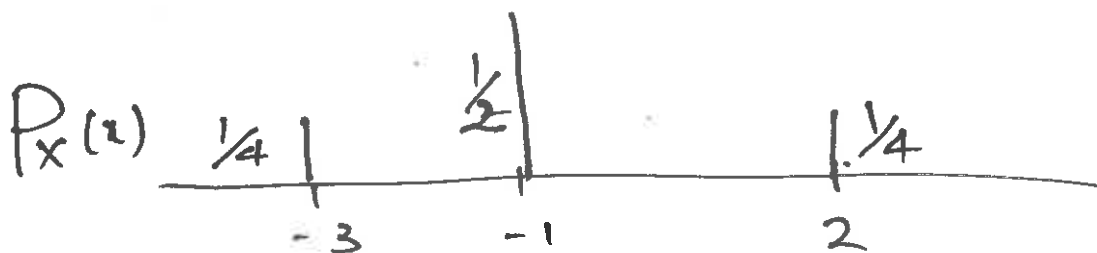
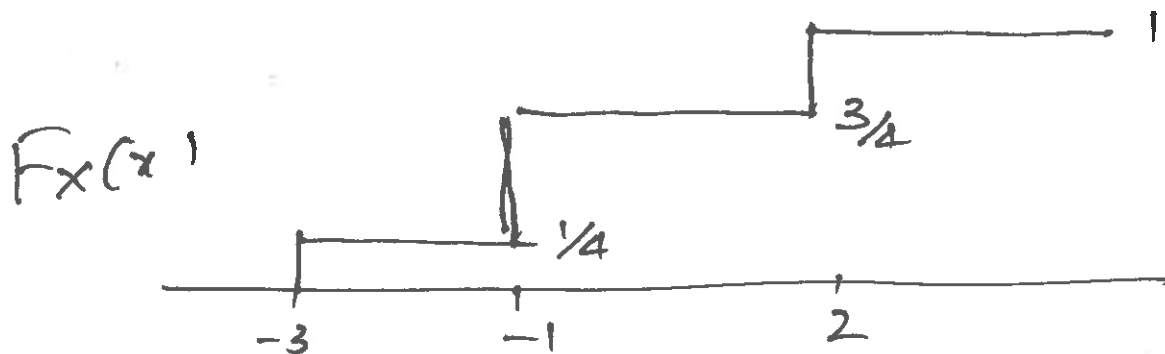
$$6b = 0.2 \rightarrow b = \frac{1}{30}$$

$$P[|X|>1] = (a+2b) + (a-2b) = 2a = \frac{2}{5}$$

[2] The cumulative distribution function of a discrete random variable X is

$$F_X(x) = \begin{cases} 0, & x < -3 \\ 1/4, & -3 \leq x < -1 \\ 3/4, & -1 \leq x < 2 \\ 1, & x \geq 2 \end{cases}$$

Find the mean and variance of X.



$$\mu_x = \sum x P_X(x) = (-3)(1/4) + (-1)(1/2) + (2)(1/4) = a$$

$$\text{Var}[x] = E[x^2] - \mu_x^2$$

$$E[x^2] = \sum x^2 P_X(x) = (-3)^2(1/4) + (-1)^2(1/2) + (2)^2(1/4) = b$$

$$\text{Var}[x] = b - a^2$$