

3.2.3

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$$a) \sum_x P_X(x) = \frac{C}{2} + \frac{C}{4} + \frac{C}{8} = \frac{7C}{8} = 1$$

$$\boxed{C = \frac{8}{7}}$$

$$b) P[X=4] = P_X(4) = \frac{8}{7 \times 4} = \left(\frac{2}{7}\right)$$

$$c) P[X < 4] = P_X(2) = \frac{8}{7 \times 2} = \left(\frac{4}{7}\right)$$

$$d) P[3 \leq X \leq 9] = P_X(4) + P_X(8)$$

$$= \frac{8}{7 \times 4} + \frac{8}{7 \times 8} = \left(\frac{3}{7}\right)$$

3.3.10

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Since on average of $T/5$ buses arrive in an interval of T minutes, buses arrive at the bus stop at a rate of $1/5$ buses per minute.

① From the definition of PMF, the PMF of B , the number of buses in T minutes is

$$P_B(b) = \begin{cases} (T/5)^b e^{-T/5} / b! & b = 0, 1, 2, \dots \\ 0 & \text{otherwise} \end{cases}$$

② Choosing $T = 2$ minutes, the probability that ③ buses arrive in 2 minute interval is

$$P_B(3) = (2/5)^3 e^{-2/5} / 3! = 0.0072.$$

④

$$⑤ P_B(0) = e^{-10/5} / 0! = e^{-2} = 0.135$$

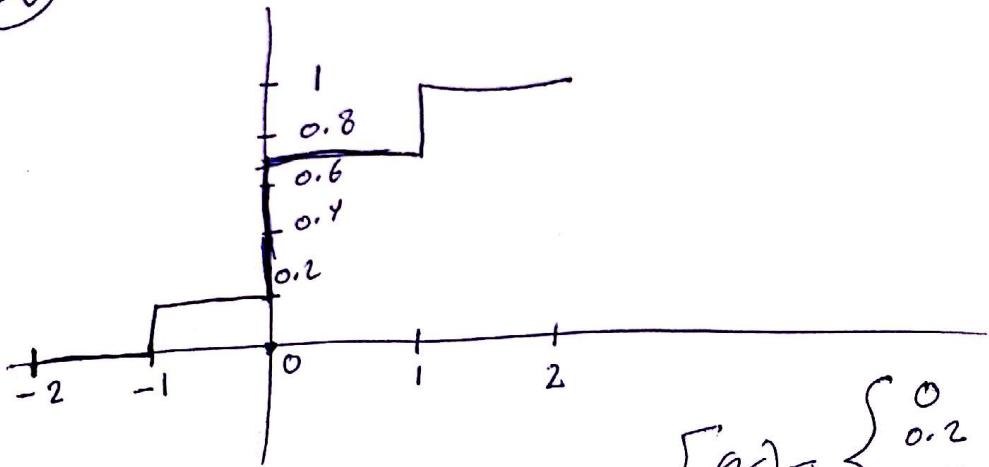
⑥ at least one bus arrives in T minutes

$$P[B \geq 1] = 1 - P(B=0) = 1 - e^{-T/5} \geq 0.99$$

3.4.2

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(a)



$$F(x) = \begin{cases} 0, & x < -1 \\ 0.2, & -1 \leq x < 0 \\ 0.7, & 0 \leq x < 1 \\ 1, & x \geq 1 \end{cases}$$

(b) The corresponding PMF of x is

$$P_X(x) = \begin{cases} 0.2, & x = -1 \\ 0.5, & x = 0 \\ 0.3, & x = 1 \\ 0, & \text{otherwise.} \end{cases}$$