

HOMEWORK - 2 Solutions

3.3.41 $E[X(X-1)] = E[X^2 - X] = E(X^2) - E(X)$

a) $E(X^2) = E[X(X-1)] + E(X) = 27.5 + 5 = \boxed{32.5}$

b) $V(X) = E(X^2) - [E(X)]^2 = 32.5 - 25 = \boxed{7.5}$

c) $V(X) = E[X(X-1)] + E(X) - [E(X)]^2$

3.5.60 a) $P(X \leq 2) = B(2; 25, 0.05) = \boxed{0.873}$

↑
from the table for
Cumulative Binomial Probabilities

b) $P(X \geq 5) = 1 - P(X \leq 4) = 1 - B(4; 25, 0.05)$
 $= 1 - 0.993 = \boxed{0.007}$

c) $P(1 \leq X \leq 4) = P(X \leq 4) - P(X \leq 0)$
 $= 0.993 - 0.277 = \boxed{0.716}$

d) $P(X=0) = P(X \leq 0) = \boxed{0.277}$

e) $E(X) = np = 25 \cdot (0.05) = \boxed{1.25}$

$$V(X) = n \cdot p \cdot (1-p) = 25 \cdot (0.05) \cdot (0.95) = \boxed{1.1875}$$

Supp. Ex. 126 $p(x, \lambda) = \frac{e^{-\lambda} \lambda^x}{x!} \quad x = 0, 1, 2, \dots$

$$\lambda = \alpha \cdot \pi R^2 = 2\pi R^2$$

$$P(\text{finding at least 1}) = 1 - P(\text{finding none}) = 0.98$$

$$1 - \frac{e^{-2\pi R^2} \cdot (2\pi R^2)^0}{0!} = 0.98$$

$$\text{So, } 0.01 = e^{-2\pi R^2}$$

$$\Rightarrow -2\pi R^2 = \ln(0.01) = -4.605$$

$$\pi R^2 = 2.3025 \Rightarrow \boxed{R = 0.8561}$$