

Problem 37

X : lifetime of printer

$X \sim \text{Exponential} (\theta = 2)$

$$f(x) = \frac{1}{2} \cdot e^{-\frac{x}{2}} \quad x > 0$$

Y : refund amount for 1 printer

$$Y = \begin{cases} 200 & 0 < x < 1 \\ 100 & 1 < x < 2 \end{cases}$$

100 printers are sold

$$\begin{aligned} E(Y_1 + Y_2 + \dots + Y_{100}) &= E(100 \cdot Y) \\ &= 100 \cdot E(Y) \end{aligned}$$

Because Y_i 's are i.i.d.

$$100 [200 \cdot P(0 < x < 1) + 100 \cdot P(1 < x < 2)]$$

$$100 [200 \cdot \int_0^1 \frac{1}{2} \cdot e^{-\frac{x}{2}} \cdot dx + 100 \cdot \int_1^2 \frac{1}{2} \cdot e^{-\frac{x}{2}} \cdot dx]$$

$$100 [200(1 - e^{-\frac{1}{2}}) + 100(e^{-\frac{1}{2}} - e^{-1})]$$

$$100 (78.69 + 23.87) = \underline{\underline{10,256}}$$

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$$E(Z) = \sum_{i=1}^{\infty} z_i \cdot p_i$$