AI1103
Assignment 5

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Let Z be an exponential random variable with mean 1. That is, the cumulative distribution function of Z is given by

$$F_Z(x) = \begin{cases} 1 - e^{-x}, & if \ x \geq 0 \\ 0, & if \ x < 0. \end{cases}$$

Then Pr(Z>2 | Z>1), rounded off to two decimal places, is equal to

Solution

Given that Z is an exponential distribution with cumulative function

$$F_Z(x) = \begin{cases} 1 - e^{-x}, & if \ x \geq 0 \\ 0, & if \ x < 0. \end{cases}$$

We know that probability density function

$$f_Z(x) = F_Z'(x) = \begin{cases} e^{-x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$$

The PDF of X and Y is,

$$f_Z(x) = \int_{-\infty}^{\infty} f(x)dx$$

$$Pr(Z > 2|Z > 1) = \frac{Pr((Z > 2) \cap (Z > 1))}{Pr(Z > 1)}$$

$$= \frac{Pr(Z > 2)}{Pr(Z > 1)}$$

$$= \frac{\int_{2}^{\infty} e^{-x}dx}{\int_{1}^{\infty} e^{-x}dx}$$

$$= \frac{-(e^{-\infty} - e^{-2})}{-(e^{-\infty} - e^{-1})}$$

$$= \frac{e^{-2}}{e^{-1}}$$

$$= e^{-1}$$

$$= 0.3679$$