assignment 6

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Outline

question

- Suppose $z = x + y$., find pdf of $f_z(z)$, and x and y are independent exponential random variables with parameter a .

solution

since x and y are exponential random variable of parameter a, we get

$$f_x(x) = ae^{-ax}U(x) \tag{1}$$

$$f_y(y) = ae^{-ay}U(y) \tag{2}$$

we can make use of below theorm to obtain this,

$$f_z(z) = \int_{x=0}^{z} f_{xy}(x,y)dydx \tag{3}$$

$$= \begin{cases} \int_0^z f_x(x)f_y(z-x)dx & z < 0 \\ 0 & z \leq 0 \end{cases} \tag{4}$$

solution

so from above theorm and using the condition x ,y are independent we get,

$$f_z(z) = \int_0^z f_x(x) f_y(z-x) dx \tag{5}$$

$$f_z(z) = \int_0^z a^2 e^{-ax} e^{-a(z-x)dx} \tag{6}$$

$$f_z(z) = a^2 e^{-az} \int_0^z dx \tag{7}$$

$$= z a^2 e^{-az} U(z) \tag{8}$$