

# Assignment 10

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# Outline

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# Question

## 6-14(Papoullis):

The random variables  $X$  and  $Y$  are independent and  $Z = X + Y$ . Find  $f_y(y)$  if

$$f_x(x) = ce^{-cx} U(x)$$

$$f_z(z) = c^2 ze^{-cz} U(z)$$

# Solution

## Solution

We know that

$$f_z(z) = \int_0^z f_x(z-y)f_y(y)dy \quad (1)$$

$$c^2ze^{-cz} = \int_0^z ce^{-c(z-y)}f_y(y)dy \quad (2)$$

$$cz = \int_0^z e^{cy}f_y(y)dy \quad (3)$$

# Solution

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differentiating on both sides we get

$$c = e^{cz} f_y(z) \quad (4)$$

$$\implies \boxed{f_y(y) = ce^{-cy}} \quad (5)$$