A Problem On Definition of Cumulative Distribution Function

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Outline

Question

Example [12^{th} Papoulis Textbook Chapter 4]:

Suppose that a random variable x is such that $x(\zeta) = a$ for every ζ in S.We Shall find it's distribubution function.

Solution

$$\implies x(\zeta) = a \leq x, \forall \zeta \tag{1}$$

$$\implies F(x) = \Pr(\mathbf{x} \leq x) \tag{2}$$

$$\implies P\{\mathbf{S}\} = 1 \tag{3}$$

$\therefore F(x) = 1, \forall\ x \geq a.$

Solution

2) for $x < a$

$$\implies \{\mathbf{x} < x\} \tag{4}$$
$$\implies F(x) = \Pr(\mathbf{x} \leq x) \tag{5}$$
$$\implies F(x) = \Pr(\phi) = 0 \tag{6}$$
$$\tag{7}$$

$\therefore F(x) = 0, \forall\ x < a.$