AI1110
Assignment 8

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Question (Papoulis Example 5.2)

We shall express the cumulative distribution function $F_Y(y)$ of the random variable $Y = X^2$ in terms of the cumulative distribution function $F_X(x)$ of the random variable X.

Solution

Case 1: $y \geq 0$

$$F_Y(y) = P(Y < y) \tag{1}$$

$$= P(X^2 < y) \tag{2}$$

$$= P(-\sqrt{y} \leq X \leq \sqrt{y}) \tag{3}$$

$$= F_X(\sqrt{y}) - F_X(-\sqrt{y}) \tag{4}$$

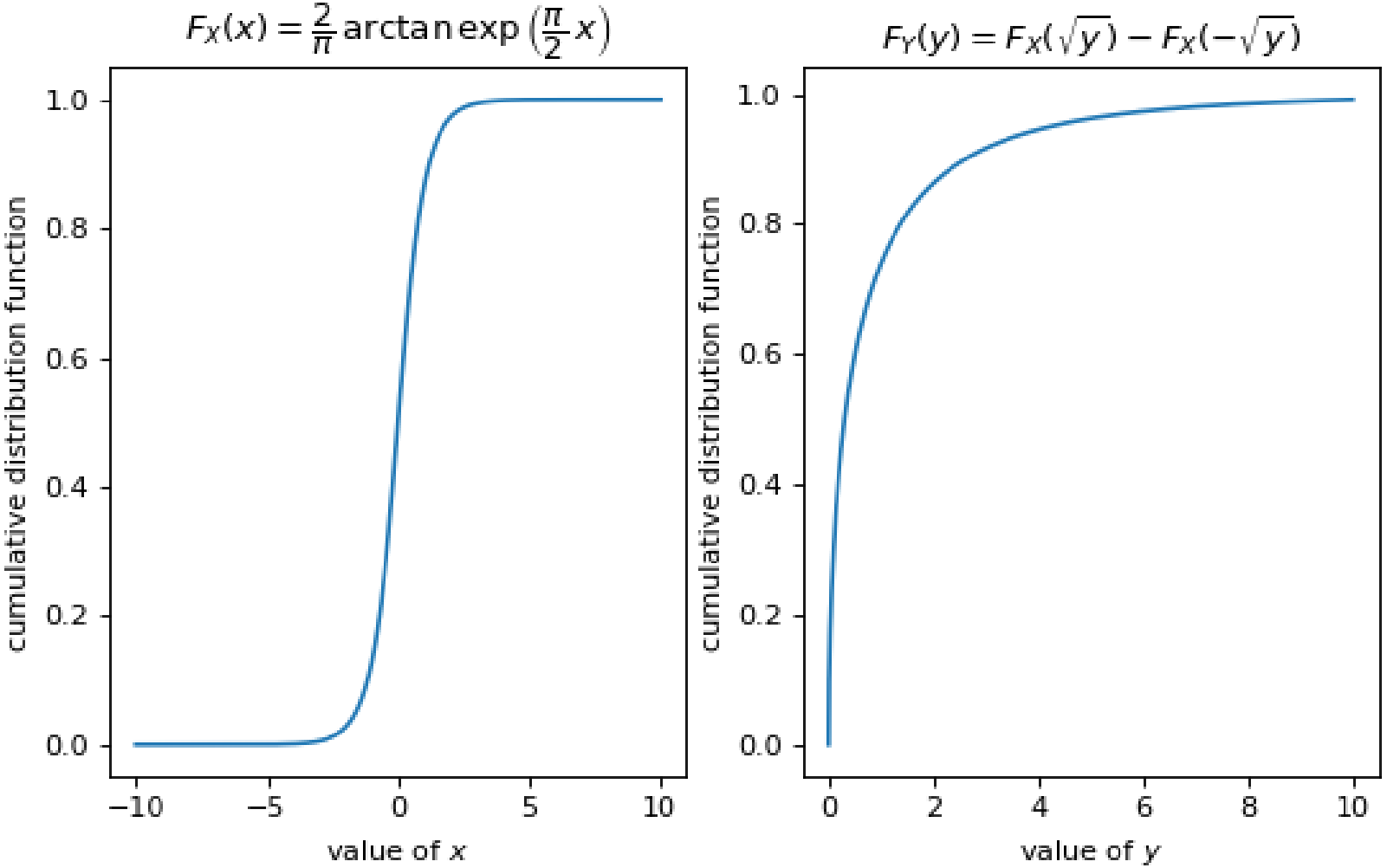
Solution(Contd.)

Case 2: $y < 0$

There are no values of X such that $X^2 < y$

Hence $F_Y(y) = P(\emptyset) = 0$

Example



Example: Let $y = 4$,$F_Y(4) = 0.945, F_X(2) = 0.9725, F_Y(-2) = 0.0275$
Hence Verified.