# AI1110
# Assignment 7

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# Question (Papoulis Problem 4.1)

Suppose that $x_u$ is the $u$ percentile of the random variable $x$, that is, $F(x_u) = u$. Show that if $f(-x) = f(x)$, then $x_{1-u} = -x_u$.

# Solution

Given,

$$f(x) = f(-x) \tag{1}$$

$$\implies \int_{-\infty}^{-x} f(x) = \int_{-\infty}^{-x} f(-x) \tag{2}$$

$$\implies \int_{-\infty}^{-x} f(x) = -\int_{\infty}^{x} f(x) \tag{3}$$

$$\implies \int_{-\infty}^{-x} f(x) = \int_{x}^{\infty} f(x) \tag{4}$$

$$\implies F(-x) - F(-\infty) = F(\infty) - F(x) \tag{5}$$

$$\implies F(-x) = 1 - F(x) \tag{6}$$

# Solution(Contd.)

Given,

$$F(x_u) = u \tag{7}$$

$$\implies 1 - F(x_u) = 1 - u \tag{8}$$

from eqn. (6),

$$1 - F(x_u) = F(-x_u) \tag{9}$$

$$\implies F(-x_u) = 1 - u \tag{10}$$

$$\implies F(-x_u) = F(x_{1-u}) \tag{11}$$

$$\implies -x_u = x_{1-u} \tag{12}$$