

Assignment 1

Vaibhav Chhabra
AI20BTECH11022

Download all python codes from

https://github.com/vaibhavchhabra25/AI1103-course/blob/main/Assignment-2/Codes/simulation_code.py

and latex codes from

<https://github.com/vaibhavchhabra25/AI1103-course/blob/main/Assignment-2/main.tex>

So, we can write

$$(F(x) - G(x))x \geq 0 \quad (2.0.7)$$

which is true for all values of x .

So, option 4 is correct.

1 PROBLEM

Consider two identically distributed zero-mean random variables U and V . Let the cumulative distribution functions of U and $2V$ be $F(x)$ and $G(x)$ respectively.

Then, for all values of x

- 1) $F(x) - G(x) \leq 0$ 3) $(F(x) - G(x))x \leq 0$
2) $F(x) - G(x) \geq 0$ 4) $(F(x) - G(x))x \geq 0$

2 SOLUTION

If X is a random variable, the cumulative distribution functions of U and $2V$ can be written in terms of X as

$$F(x) = \Pr(X \leq x) \quad (2.0.1)$$

$$G(x) = \Pr(2X \leq x) \quad (2.0.2)$$

Or,

$$G(x) = \Pr(X \leq x/2) \quad (2.0.3)$$

So, on subtracting we get,

$$F(x) - G(x) = \Pr(X \leq x) - \Pr(X \leq x/2) \quad (2.0.4)$$

For $x \geq 0$

$$F(x) - G(x) \geq 0 \quad (2.0.5)$$

And for $x \leq 0$

$$F(x) - G(x) \leq 0 \quad (2.0.6)$$