Assignment 5

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Download all python codes from

https://github.com/sujal100/Probability_and_Random_variable/tree/main/exercise_5/codes

and latex codes from

https://github.com/https://github.com/sujal100/Probability_and_Random_variable/blob/main/exercise_5/exercise_5_main_tex.tex

1 Problem [GATE(2003)EC-61]

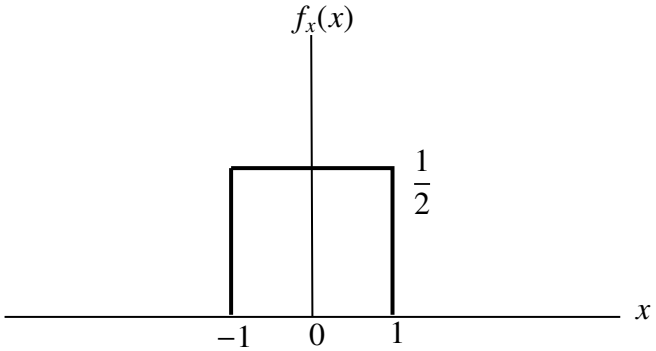
Let X and Y be two statistically independent random variables uniformly distributed in the ranges $(-1, 1)$ and $(-2, 1)$ respectively. Let $Z = X + Y$. then the probability that $[Z \leq -2]$ is

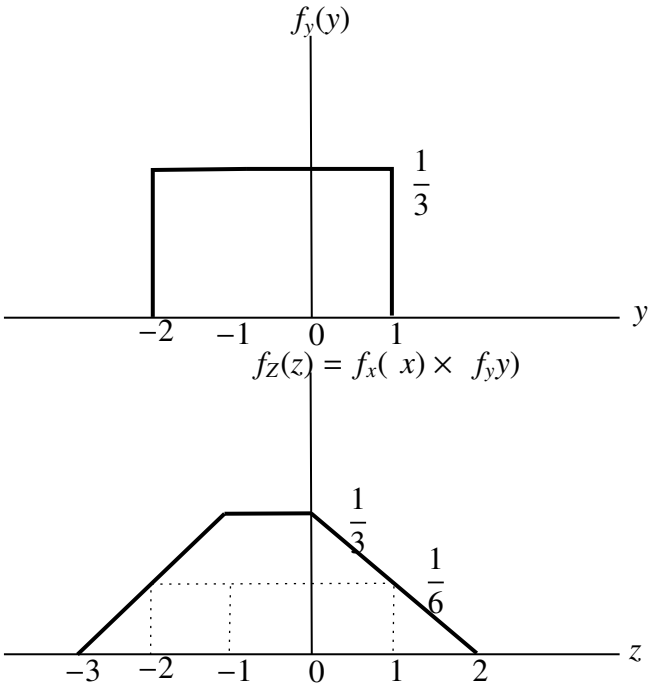
a) zero
b) $\frac{1}{6}$
c) $\frac{1}{3}$
d) $\frac{1}{12}$

2 Solution

The pdf of $Z(= X + Y)$ will be convolution of pdf of X and pdf of Y as shown below.

$$f_x(x) \times f_y(y) = f_z(z) \tag{2.0.1}$$





Now

$$\Pr(Z \leq z) = \int_{-\infty}^{z} f_Z(z)dz \tag{2.0.2}$$

$$\Pr(Z \leq -2) = \int_{-\infty}^{-2} f_Z(z)dz \tag{2.0.3}$$

$$= \text{Area } [z \leq -2] \tag{2.0.4}$$

$$= \frac{1}{2} \times \frac{1}{6} \times 1 = \frac{1}{12} \tag{2.0.5}$$

Hence (D) is correct option.