

Assignment 5

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You can Download latex-tikz codes from

https://github.com/pranav-159/ai1103_Probability_and_Random_variables/blob/main/Assignment_5/Assignment5.tex

1 PROBLEM(GATE 2016 (MA), Q.10)

Let the probability density function of a random variable X be

$$f(x) = \begin{cases} x & 0 \leq x < \frac{1}{2} \\ c(2x-1)^2 & \frac{1}{2} \leq x < 1 \\ 0 & \text{Otherwise} \end{cases}$$

Then value of c is equal to ...

2 SOLUTION(GATE 2016 (MA), Q.10)

We know that,

$$\int_{-\infty}^{\infty} f_x(x) dx = 1 \quad (2.0.1)$$

$$\int_{-\infty}^0 f_x(x) dx + \int_0^{\frac{1}{2}} f_x(x) dx + \int_{\frac{1}{2}}^1 f_x(x) dx + \int_1^{\infty} f_x(x) dx = 1 \quad (2.0.2)$$

$$\int_0^{\frac{1}{2}} x dx + \int_{\frac{1}{2}}^1 c(2x-1)^2 dx = 1 \quad (2.0.3)$$

$$\left[\frac{x^2}{2} \right]_0^{\frac{1}{2}} + c \left[\frac{(2x-1)^3}{6} \right]_{\frac{1}{2}}^1 = 1 \quad (2.0.4)$$

$$\frac{1}{8} + \frac{c}{6} = 1 \quad (2.0.5)$$

$$c = \frac{21}{4} \quad (2.0.6)$$

$$\therefore \text{Required value of } c = \frac{21}{4}$$

