Assignment
(instead of midterm)

MAT 361

Probability and Statistics

Section 4

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North South University

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Assignment 2

Classwork 1.

given,

$$f(x) = \frac{1}{x \ln(1.5)}$$

(i) $$\int_4^6 \frac{1}{x \ln(1.5)}\, dx = \frac{1}{\ln(1.5)} \int_4^6 \frac{1}{x}\, dx$$

$$= \frac{1}{\ln(1.5)} \times [\ln(x)]_4^6$$

$$= \frac{1}{\ln 1.5} \times [\ln(6) - \ln(4)]$$

$$= 1. \quad [\text{using calculator}]$$

Since, the integration of $f(x) = 1$, so this is a valid probability density function.

(ii) Here, $P(4.5 \leq X \leq 5.5)$

$$= \int_{4.5}^{5.5} \frac{1}{x \ln(1.5)}\, dx$$

$$= \frac{1}{\ln(1.5)} \times [\ln(x)]_{4.5}^{5.5}$$

$$= \frac{1}{\ln(1.5)} \times [\ln(5.5) - \ln(4.5)]$$

$$= 0.495$$

Answer

(iii) $$F(x) = \int_4^x \frac{1}{x \ln(1.5)}\, dx = \frac{1}{\ln(1.5)} \int_4^x \frac{1}{x}\, dx \quad [\text{for } 4 \leq x \leq 6]$$

$$= \frac{1}{\ln(1.5)} [\ln(x)]_4^x$$

$$= \frac{1}{\ln(1.5)} [\ln x - \ln 4]$$

Answer

classwork 2

Given, $f(x) = \frac{512}{93}\left[0.5 - (x-0.25)^2\right]$ for $0.125 \le x \le 0.5$

expected or average paint thickness,

$$E(x) = \int_{0.125}^{0.5} x\, f(x)\, dx$$

$$= \int_{0.125}^{0.5} x \frac{512}{93}\left[0.5 - (x-0.25)^2\right] dx$$

$$= \frac{512}{93} \int_{0.125}^{0.5} \left[0.5x - x^3 + 0.5x^2 - 0.0625x\right] dx$$

$$= \frac{512}{93} \int_{0.125}^{0.5} \left[-x^3 + 0.5x^2 + 0.4375x\right] dx$$

$$= \frac{512}{93}\left[\left[-\frac{x^4}{4}\right] + \left(0.5 \cdot \frac{x^3}{3}\right) + \left(0.4375 \cdot \frac{x^2}{2}\right)\right]_{0.125}^{0.5}$$

$$= \frac{512}{93}\left[\frac{23}{384} - \frac{181}{49152}\right]$$

$$= \frac{512}{93} \times \frac{921}{16384}$$

$$= \frac{307}{992}$$

$$= 0.309$$

Answer