

AI1110

Assignment 10

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CS21BTECH11059

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Outline

1 Question

question 5.30

If x is uniform in the interval $(10,12)$ and $y = x^3$ (a) find $f_y(Y)$; (b) find $E(y)$:
(i) exactly (ii) using (5.86).

Theory

a) $y = x^3$ then $x = y^{\frac{1}{3}}$ so $g'(x) = 3x^2 = 3y^{\frac{2}{3}}$

here $f_x(x) = 0.5$ because as x is uniformly distributed the max probability that we get is 1 and the change in x value is 2 so height must be 0.5 in order to get area as 1 for $10 < x < 12$;

Calculation

So

$$f_y(y) = \frac{f_x(x)}{|y'(x)|} \quad (1)$$

$$= \frac{0.5}{3y^{\frac{2}{3}}} \quad (2)$$

for $10 < x < 12$

else 0 for rest interval

$$b) E(x^3) = 0.5 \int_{10}^{12} x^3 dx = 1342$$

with $g(x) = x^3$ $E(X) = 11$, $\sigma_x = \frac{1}{3}$ so

$$E(X^3) \cong 11^3 + 6 \times 11 \times \frac{1}{6} = 1342 \quad (3)$$