

AI1110

Assignment 4

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LATEX

Outline

1 Question

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Question

If x is $N(1000; 400)$ find (a) $P\{x < 1024\}$, (b) $P\{x < 1024 \text{ } x > 961\}$, and (c) $P\{31 < \sqrt{x} \leq 32\}$.

Solution

x is in Normal distribution $N(\mu, \sigma^2)$ will be used to represent the Gaussian p.d.f

$$F_x(x) = \int_{-\infty}^x \frac{1}{\sqrt{2\pi\sigma^2}} e^{-(y-\mu)^2/2\sigma^2} dy = G\left(\frac{x-\mu}{\sigma}\right) \quad (1)$$

$$\mu = 1000$$

$$\sigma = 20$$

Solution-part-a

(a)

$$\begin{aligned} P\{x < 1024\} &= G\left(\frac{1024 - 1000}{20}\right) \\ &= G(1.2) \\ &= 0.8849 \end{aligned}$$

Solution-part-b & c

(b)

$$\begin{aligned} P\{x < 1024 | x > 961\} &= \left(\frac{P\{961 < x < 1024\}}{P\{x > 961\}} \right) \\ &= \left(\frac{G(1.2) - G(-1.95)}{1 - G(-1.95)} \right) \\ &= 0.8819 \end{aligned}$$

(c)

$$P\{31 < \sqrt{x} \leq 32\} = P\{961 < x \leq 1024\} = 0.8593$$