AI1110
Assignment 5

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Outline

EXAMPLE 4.25

Q:- We now assume that $p = 0.6$ and we wish to find n such that the probability that k is between $0.59n$ and $0.61n$ is at least 0.98

Solution

In this case. p = 0.6, q = 0.4

$$\Pr\left(0.59n \leq k \leq 0.61n\right) \approx G\left(\frac{0.61 \times n - 0.6 \times n}{\sqrt{0.4 \times 0.6 \times n}}\right) - G\left(\frac{0.59 \times n - 0.6 \times n}{\sqrt{0.4 \times 0.6 \times n}}\right) \tag{1}$$

$$G(x) = \int_{-\infty}^{x} \frac{e^{\frac{-y^2}{2}}}{\sqrt{2 \times \pi}} dy \tag{2}$$

$$G(-x) = 1 - G(x) \tag{3}$$

$$\Pr\left(0.59n \leq k\ 0.61n\right) \approx G\left(\frac{0.01 \times n}{\sqrt{0.24 \times n}}\right) + G\left(\frac{-0.01 \times n}{\sqrt{0.24 \times n}}\right) \tag{4}$$

Computation

$$\Pr\left(0.59n \leq k \leq 0.61n\right) \approx 2 \times G\left(\frac{0.01 \times n}{\sqrt{0.24 \times n}}\right) - 1 \tag{5}$$

Hence,

$$2 \times G\left(\frac{0.01 \times n}{\sqrt{0.24 \times n}}\right) - 1 \geq 0.98 \tag{6}$$

$$G\left(\frac{0.01 \times n}{\sqrt{0.24 \times n}}\right) \geq 0.99 \tag{7}$$

$$\frac{0.01 \times n}{\sqrt{0.24 \times n}} \geq 2.35 \tag{8}$$

$$0.24 \times n \geq \left(\frac{2.35}{0.01}\right)^2 \tag{9}$$

Hence, n >13254

Conclusion

The value of n such that the probability that k is between 0.59n and 0.61n is at least 0.98 is atleast 13254.

G(x)

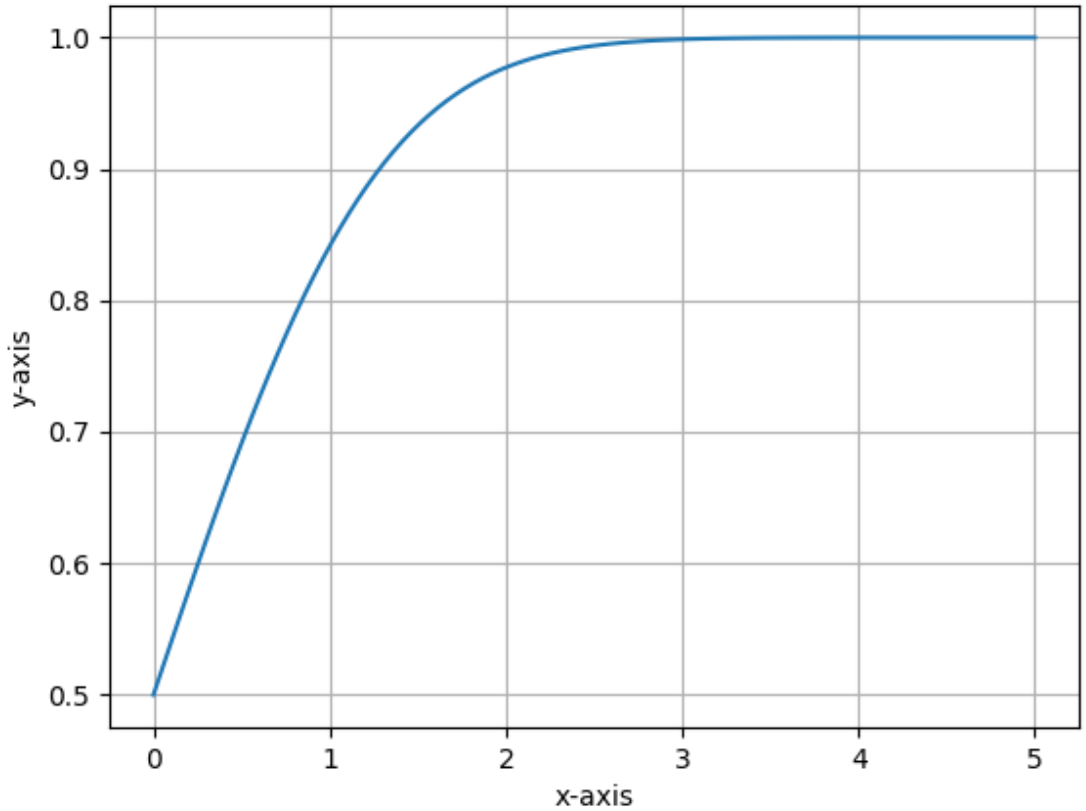

Figure: G(x) graph

python output

```
2* G(.01*math.sqrt(13254/.24)-1= 0.9812265889303231
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Figure: output of python code