Normal Distribution

A continuous random variable X is said to have a normal distribution $X \sim N(\mu,\sigma)$ if it has probability density function.

$$f(x) = f(x;\mu,\sigma) = \begin{cases} \dfrac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}; & -\infty < x < \infty, \\ 0; & \text{otherwise} \end{cases}$$

Instructions

Do not forget to transfer $X \sim N(\mu, \sigma)$ to $Z \sim N(0,1$

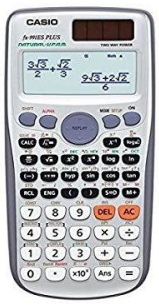
P(z>a)= you should use R(a)

P(z<a) you should use P(a)

p (0 <z< a) you should use Q(a)

p (a <z< o) you should use Q(a)

p (a <z< b) you should use Q(a)+Q(b)



fx~991ES plus

fx~570ES plus

Example 4.12

Suppose that the birth weight of Saudi babies X has a normal distribution with mean

.μ = 3.4 and standard deviation σ = 0.35

Find the probability that a randomly chosen Saudi baby has a birth weight

.between 3.0 and 4.0 kg

solution:

1-p (3 <X< 4) = P ((3-3.4)/0.35<Z<(4−3.4)/0.35) = P(−1.14 <Z< 1.71)

.First click on  , then click on 3  , after that click on 1  ,

then you should press  ,and after that press on shift+1 , then press on 5

 ,then click on 2  , insert (-14.1)  , after that

click on (+), then click on shift+1 , and then press 5  , press on 2 

, insert (1.71)  , at the end press(=) ,the result is0.82923 .

2-p (X<4)= P (Z<(4−3.4)/0.35) = P(Z<1.71)

.First click on  , then click on 3  , after that click on 1  ,

then you should press  ,and after that press on shift+1 , then press on 5

 ,then click on 1  , insert (1.71)  at the end

press(=),,the result is0.95637.

3-p (X>3) = P (Z>3−3.4)/0.35) = P(Z>-1.14)

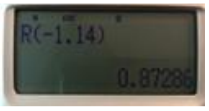
.First click on  , then click on 3 

, after that click on 1 

, then you should press 

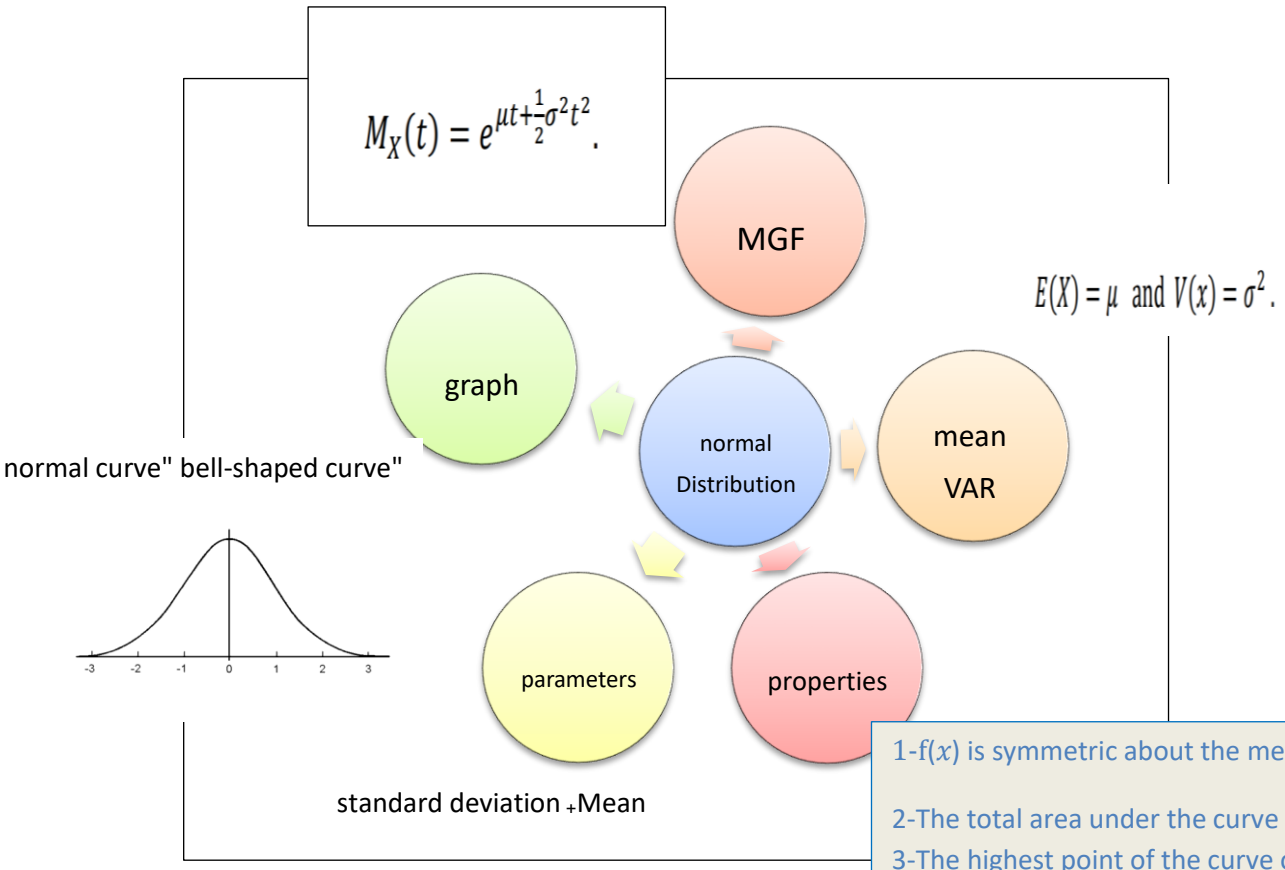
,and after that press on shift+1 , then press on 5 

,then click on 3 

, insert (-1.14) 

at the end press(=),,the result is0.87286.

3-p (X=6) =0



1-f(x) is symmetric about the mean μ.

2-The total area under the curve of (x) = 1.
3-The highest point of the curve of f(x) at the mean μ.

4- The mode, which is the point on the horizontal axis where the curve is a maximum, occurs at = μ , (Mode = Median = Mean).

5-The curve has its points of inflection at $X = \mu \pm \sigma$ is concave downward if $\mu - \sigma < X < \mu + \sigma$ and is concave upward otherwise.

6- The normal curve approaches the horizontal axis asymptotically as we proceed in either direction away from the mean.

7- The location of the normal distribution depends on μ and its shape depends on σ.

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