"Continuous probability distribution"

if X is continuous r.v., then:

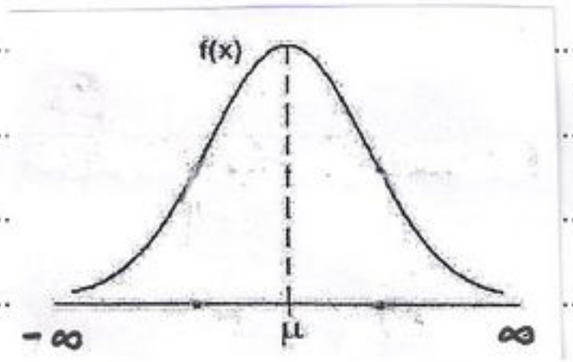
① $P(X=a)=0$ for any constant a.

② $P(X\leq b)=P(X<b)$.

③ $P(X\geq a)=P(X>a)$.

④ $P(a\leq X\leq b)=P(a<X<b)=P(a\leq X<b)=P(a<X\leq b)$.

Normal distribution of continuous r.v. X with parameters mean μ (determines the location) and variance σ^2 or standard deviation σ (determines the shape) i.e: $X\sim N(\mu,\sigma^2)$ or $X\sim Normal(\mu,\sigma^2)$:



"total area under the curve of $f(x)$ equals to 1"

① X is continuous random variable $(-\infty<X<\infty)$.

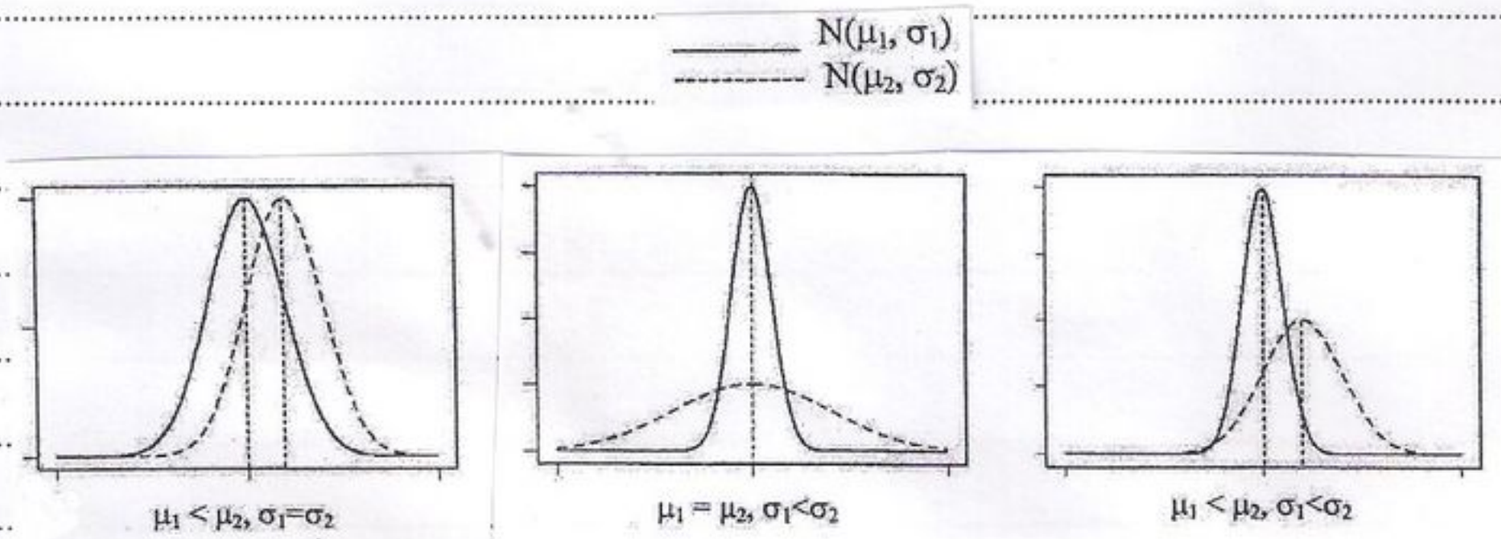
② $f(x)$ (density function of X) has bell-shaped curve.

③ the highest point of the curve of $f(x)$ at μ.

④ the curve of $f(x)$ is symmetric about μ.

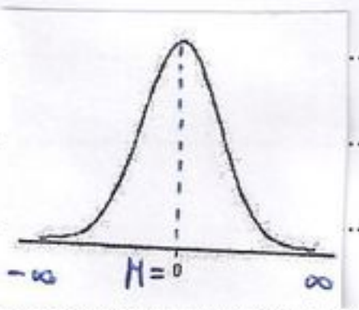
⑤ $\mu=mean=mode=median$.

⑥ the location depends on μ and the shape depends on σ:



Standard normal distribution of continuous r.v. Z i.e. $Z \sim N(\mu=0, \sigma^2=1)$:

$-\infty < Z < \infty$

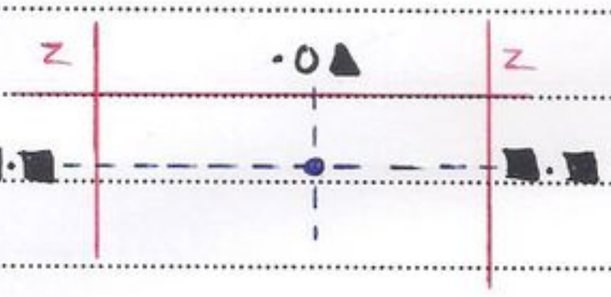


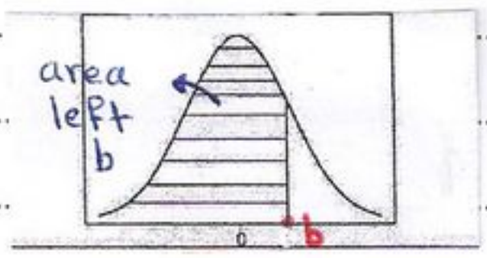
① calculating the probabilites of $P(a < Z) = ?$, $P(Z < b) = ?$ and $P(a < Z < b) = ?$ by using the table :

(i) $P(Z = a) = 0$ for any constant a.

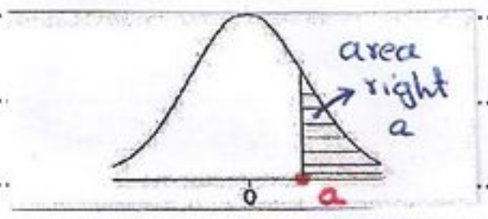
(ii) $P(Z < b)$ = from the table.

if $b = \blacksquare.\blacksquare\blacktriangle = \blacksquare.\blacksquare + .0\blacktriangle$

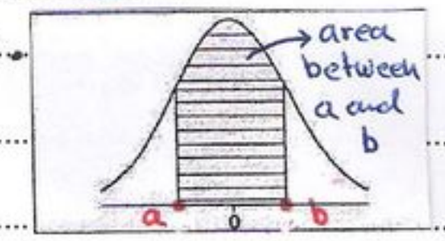




(iii) $P(a < Z) = 1 - P(Z < a)$.



(iv) $P(a < Z < b) = P(Z < b) - P(Z < a)$.



(v) $P(0 < Z) = P(Z < 0) = .5$.

② $X \sim N(\mu, \sigma^2)$ where $\mu \neq 0$ or $\sigma^2 \neq 1 \Rightarrow Z = \frac{X-\mu}{\sigma} \sim N(0,1)$

هنا إذا كان لدينا متغير عشوائي X يتبع التوزيع الطبيعي العادي، فإننا نستطيع تحويل X إلى توزيع طبيعي معياري Z حتى يتسنى لنا استخدام الجدول الخاص بـ Z.

③ $P(Z < Z_A) = A$:

(i) $A < .5$ ⟵ هنا نبحث في الجدول السالب

$A > .5$ ⟵ هنا نبحث في الجدول الموجب

(ii) أحيانا نوجد A بشكل صريح وأحيانا يكون متخفيا بشكل ضمني بين رقمين.

(iii) as Z is symmertric about $\mu=0$, then $Z_A = -Z_{1-A}$.