Normal Distribution or Gaussian Distribution →

The normal or (Gaussian) Distribution is defined by the probability density function

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}, \quad -\infty \le x < \infty$$

where μ and $\sigma > 0$ are the parameters of the distribution.

Clearly (i) $f(x)$ is non negative

or

$$f(x) \geq 0$$

(ii) $\int_{-\infty}^{\infty} f(x)\, dx = 1$ i.e total area under the normal curve above the X-axis is

Proof → $\int_{-\infty}^{\infty} f(x)\, dx = \frac{1}{\sigma\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2} dx$

$$= \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-\frac{1}{2}z^2} dz$$

let $z = \frac{x-\mu}{\sigma}$

$\sigma dz = d$

$$= \frac{2}{\sqrt{2\pi}} \int_{0}^{\infty} e^{-\frac{1}{2}z^2} dz$$

$\int_{-\infty}^{\infty} f z = 2\int_{0}^{\infty} d$

$$= \sqrt{\frac{2}{\pi}} \int_{0}^{\infty} e^{-\frac{1}{2}z^2} dz$$

let $\frac{1}{2}z^2 =$

$\frac{1}{2} \cdot 2z\,dz =$

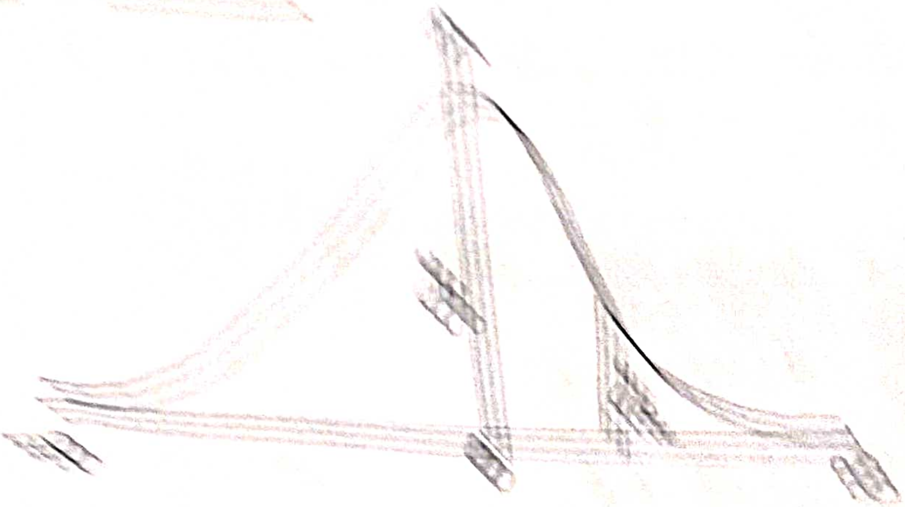
$z\,dz =$

$dz = \frac{d}{}$

$$= \sqrt{\frac{2}{\pi}} \int_{0}^{\infty} e^{-t} \cdot \frac{dt}{\sqrt{2t}}$$

[illegible]

Normal Curve



The area given by [illegible]

[illegible]

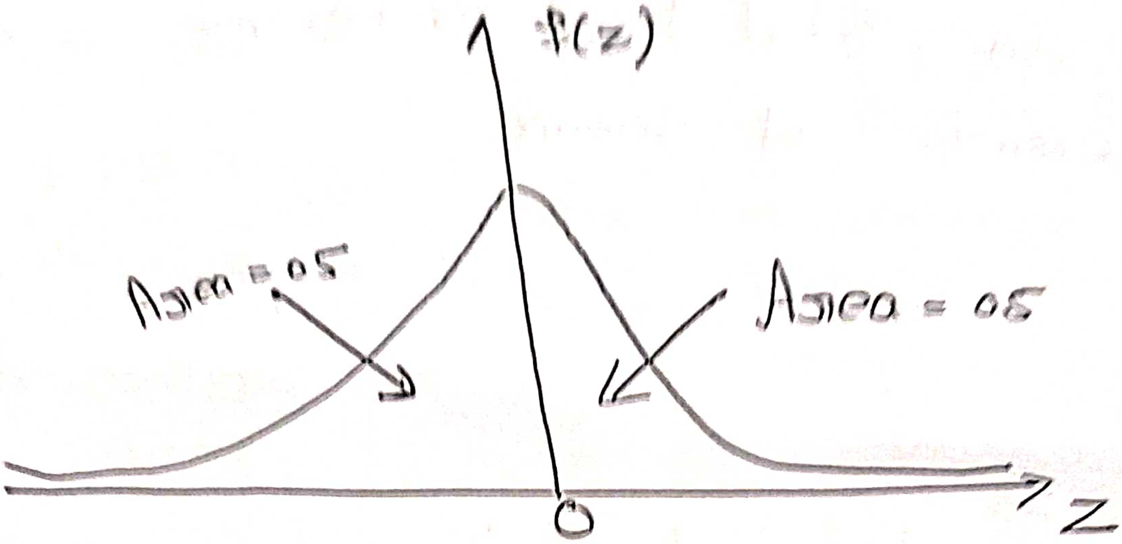
is known as normal curve when origin is taken at mean then

[illegible] $\mu = 0$ origin

Area Under Normal Curve

By taking $Z = \frac{x-\mu}{\sigma}$, standard normal curve is formed.

The total area under this curve is 1.



The area under the curve is divided into two equal parts by $Z=0$.

The area between the ordinate $Z=0$ and any other ordinate can be noted from the supplied table.

It should be noted that mean for the Normal Distribution is 0