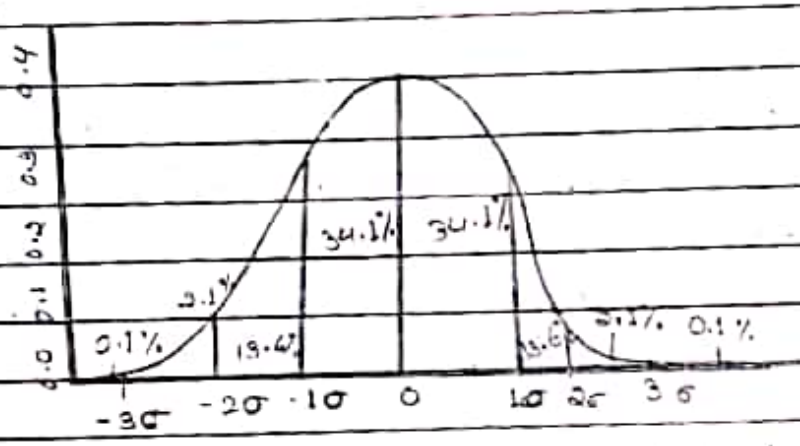
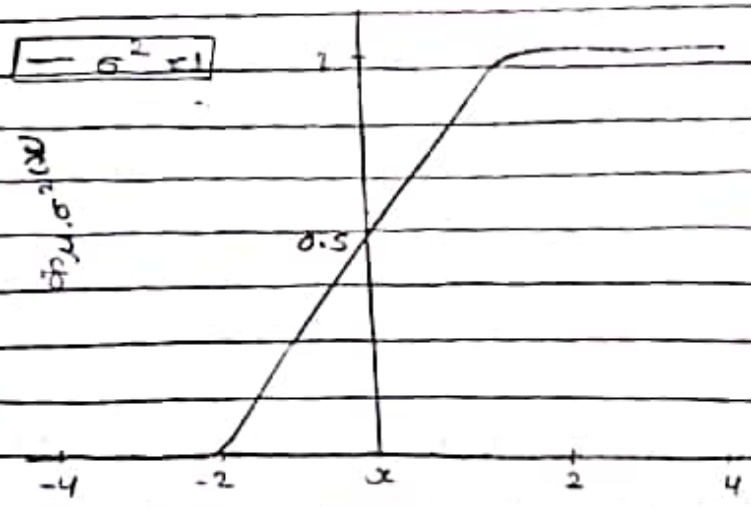
Dr. Rajesh Verma, Assistant professor and Head, U.G. Department of zoology D.K. College Dumraon (Buxar). Notes for B.Sc part 1st, paper 2 (A).

Question :- Write notes on STANDARD DEVIATION ?

Answer :-



A plot of normal distribution (or bell-shaped curve) where each band has a width of 1 standard deviation - See also: 68-95-99.7 rule.



cumulative probability of a normal distribution with expected value 0 and standard deviation 1.

In statistics, the standard deviation is a measure of the amount of variation or dispersion of a set of values. A low standard deviation indicates that the values tend to be close to the mean (also called the expected value) of the set, while a high standard deviation indicates that the values are spread out over a wider range.

Basic examples :-

Sample standard deviation of metabolic rate of northern fulmars

Logan gives the following example. Furness and Bryant measured the resting metabolic rate for 8 male and 6 female breeding northern fulmars. The table shows the furness data set.

Furness data set on metabolic rates of northern fulmars

Sex	Metabolic rate	Sex	Metabolic rate
Male	525.8	Female	727.7
Male	605.7	Female	1086.5
Male	843.3	Female	1091.0
Male	1195.5	Female	1361.3
Male	1945.6	Female	1490.5
Male	2135.6	Female	1956.1
Male	2308.7		
Male	2950.0		

The graph shows the metabolic rate for males and females. By visual inspection, it appears that the variability of the metabolic rate is greater for males than for females.

Definition of population values:-

let X be a random variable with mean value μ:-

$E[X] = \mu$.

Here the operator E denotes the average or expected value of X. Then the standard deviation of x is the quantity

$$\sigma = \sqrt{E[(x-\mu)^2]}$$

$$= \sqrt{E[X^2] + E[-2\mu X] + E[\mu^2]}$$

$$= \sqrt{E[X^2] - 2\mu E[X] + \mu^2}$$

$$= \sqrt{E[X^2] - 2\mu^2 + \mu^2}$$

$$= \sqrt{E[X^2] - \mu^2}$$

$$= \sqrt{E[X^2] - (E[X])^2}$$

Discrete random variable

(derived using the properties of expected value)

In other words, the standard deviation σ (sigma) is the square root of the variance of x; i.e., it is the square root of the average value of $(x-\mu)^2$.