SECTION 7.1 – Properties of the Normal Distribution

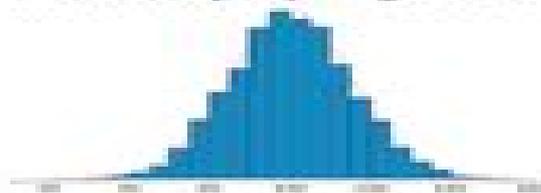### Probability Density Function (pdf)

A **probability density function** is an equation used to compute probabilities of continuous random variables. It must satisfy the following two properties:

1. The total area under the graph of the equation over all possible values of the random variable must equal 1.

2. The height of the graph of the equation must be greater than or equal to 0 for all possible values of the random variable.

Relationship between areas and probabilities

The area under the graph of a density function over an interval represents the probability of observing a value of the random variable in that interval.
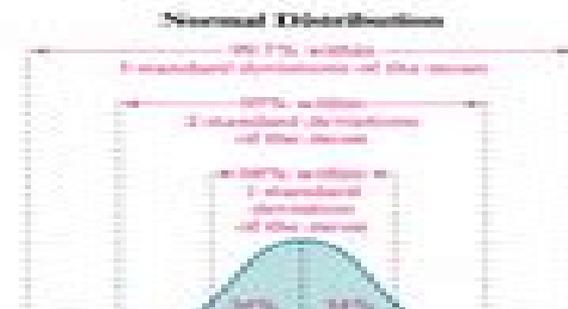
Definition – A continuous random variable is normally distributed, or has a normal probability distribution, if its relative frequency histogram has the shape of a normal curve.
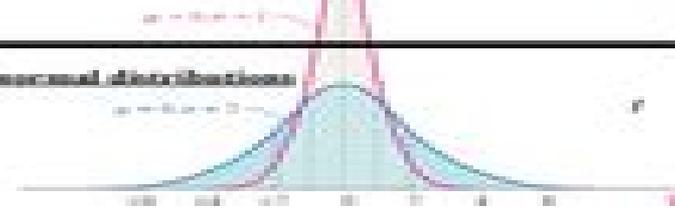

Note: Inflection points are the points on the curve where the curvature (or concavity) of the graph changes.

Properties of the Normal Density Curve

1. It is symmetric about its mean, μ.

2. Because mean = median = mode, the curve has a single peak and the highest point occurs at $x = \mu$.

3. It has inflection points at $\mu - \sigma$ and $\mu + \sigma$.

4. The area under the curve is 1.

5. The area under the curve to the right of μ equals the area under the curve to the left of μ, which equals $\frac{1}{2}$.

6. As x increases without bound (gets larger and larger), the graph approaches, but never reaches, the horizontal axis. As x decreases without bound (gets more and more negative), the graph approaches, but never reaches, the horizontal axis.

7. The Empirical Rule

   Approximately 68% of the area under the normal curve is between $\mu - \sigma$ and $\mu + \sigma$; approximately 95% of the area under the normal curve is between $\mu - 2\sigma$ and $\mu + 2\sigma$; approximately 99.7% of the area under the normal curve is between $\mu - 3\sigma$ and $\mu + 3\sigma$.

Normal Distribution

Examples and comparisons of normal distributions

Math A160 Introduction To Statistics

Thomas Griffiths

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   Mathematical Reviews ,1987   **Computational Statistics in the Earth Sciences** Alan D. Chave,2017-10-19 This book combines theoretical underpinnings of statistics with practical analysis of Earth sciences data using MATLAB Supplementary resources are available online   Probability and Statistics in Geodesy and Geophysics Ludmila Kubáčková,Lubomír Kubáček,Ján Kukuča,1987 The purpose of data processing is to obtain in explicit form maximum information on the object of the data measurements This is accomplished by the use of suitable models based on the most up to date knowledge of the theory of probability and mathematical statistics The need to constantly improve models for processing data sets is stimulated by the rapid development of geodetic and geophysical measurement techniques on the one hand and the possibilities of contemporary computer techniques on the other The reasons for the incessant improvement of mathematical models are both gnostic and economic experiments in particular are time consuming and expensive to prepare and carry out moreover they may be unique and impossible to repeat To develop an effective method for preparing such experiments and a correct procedure for processing the results is a theoretically exacting although least costly part of the whole process of preparation realization and the evaluation of the measurements The purpose of this book is to acquaint the reader with the mathematical methods in use at present including those being developed and applied in advanced geodetic and geophysical centres   *Government Reports Announcements & Index* ,1986   **Computers, Control & Information Theory** ,1986   *Learning Disabilities, Literacy, and Adult Education* Susan Ann Vogel,Stephen M. Reder,1998 In this book experts in the fields of LD and adult literacy describe the characteristics demographics education and employment status of adults with severe learning disabilities and discuss the laws that protect them in the workplace and in educational settings Sample forms checklists resource lists and examples from staff preparation programs are included   Solids Far from Equilibrium C. Godrèche,1992-01-09 Originally published in 1991 this book based on the 1989 Beg Rohu summer school contains six sets of pedagogical lectures by internationally respected researchers on the statistical physics of crystal growth Providing a course in which the phenomena of shape and growth are viewed from a fresh vantage point the lectures cover a variety of developments in the field and reflect on problems that have received inadequate attention Statistical physicists condensed matter physicists metallurgists and applied mathematicians will find this a stimulating and valuable book on an important topic   *Referativnyĭ zhurnal* ,1985   **Government Reports Annual Index** ,1986   **Science Citation Index** ,1993 Vols for 1964 have guides and journal lists   Introduction to Statistics Gottfried E. Noether,2012-09-27 The introductory statistics course presents serious pedagogical problems to the instructor For the great majority of students the course represents the only formal contact with statistical thinking that he or she will have in college Students come from many different fields of study and a large number suffer from math anxiety Thus an instructor who is willing to settle for some limited objectives will have a much better chance of success than an instructor who aims for a broad exposure to

statistics Many statisticians agree that the primary objective of the introductory statistics course is to introduce students to variability and uncertainty and how to cope with them when drawing inferences from observed data Addi tionally the introductory COurse should enable students to handle a limited number of useful statistical techniques The present text which is the successor to the author s Introduction to Statistics A Nonparametric Approach Houghton Mifflin Company Boston 1976 tries to meet these objectives by introducing the student to the ba sic ideas of estimation and hypothesis testing early in the course after a rather brief introduction to data organization and some simple ideas about probability Estimation and hypothesis testing are discussed in terms of the two sample problem which is both conceptually simpler and more realistic than the one sample problem that customarily serves as the basis for the discussion of statistical inference

   Introduction to Statistics Howard B. Christensen,Andrew S. Gibbons,1973   *Foundations of Mathematics and Statistics* Timothy C. Kearns,2019-01-26 Foundations of Mathematics and Statistics is a summary of the basic principles of math and statistics for students that are interested in pursuing studies in the mathematical sciences The first goal is to provide a good foundation of knowledge and ability with the basics of mathematics This includes logic sets number systems algebra geometry trigonometry and the calculus Then the remainder of the book deals with the fundamental topics of applied and mathematical statistics including probability random variables expected value samples distributions hypothesis testing confidence intervals and an introduction to linear regression and correlation The book can be used by all students that need a summary of math fundamentals with a sound introduction to the basics of statistical thinking and methodology Those that need a good familiarity with math and statistics would find this book a valuable supplemental reading along with the fair amount of exercises that are included in order to reinforce the important ideas   *Introduction to Mathematical Statistics* Paul G. Hoel,1984-01-31 A balanced presentation of both theoretical and applied material with numerous problem sets to illustrate important concepts Demonstrates the use of computers and calculators to facilitate problem solving as well as numerous applications to illustrate basic theory   Introduction to Mathematical Statistics Robert V. Hogg,Joseph W. McKean,Allen Thornton Craig,2005 For one or two semester undergraduate mathematical statistics course or for beginning graduate courses in mathematical statistics This classic text retains its outstanding features and continues to provide students with excellent background in the mathematics of statistics Extensively revised with three new chapters

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