

# The Calculus of Statistics

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## 1 Functions

### 1.1 Probability Density Functions

A **probability density function (PDF)** gives the probability  $p(x)$  of an outcome  $x$  occurring.

- The probability of any  $x$  occurring is either positive or zero, so a PDF can never be negative.

$$p(x) \geq 0 \text{ for all } x \tag{1}$$

- The area under the curve must equal 1.

$$\int_{-\infty}^{\infty} p(x) \, dx = 1 \tag{2}$$

### 1.2 Cumulative Density Functions

A **cumulative density function (CDF)** gives the probability  $c(x)$  of any outcome  $\leq x$  occurring.