

CALCULUS

The Sigma Summation Symbol

$$\sum_{j=1}^n A_j$$

The above reads as: *the summation from j equal 1 to n of A sub j*. It is the same as:

$$A_1 + A_2 + A_3 + \dots + A_n$$

Infinity

∞ , indicates infinity. Note that in calculus we never use infinity as a number, but rather as a limit. If x can range from zero to ∞ , then its *lower bound* is zero, but x has *no upper bound*.

Limits

$$\lim_{x \rightarrow 0} f(x)$$

reads as: *the limit as x approaches zero of f(x)*.

Derivatives

The process of finding a derivative is called *differentiation*.

$dy/dx = y'$ where y is a function of x and reads as: *the derivative of y with respect to x*.

You can also say: "d y by d x", or "d y over d x". "d y d x" is often used but may lead to confusion.

Second derivatives are read as *the second derivative of y with respect to x*.

$$d^2y / dx^2 = y''$$

Higher derivatives are read as *the nth derivative of y with respect to x*.

$$d^n y / dx^n = y^{(n)}$$

Partial derivatives

$$\partial y / \partial x$$

The above is read *the partial derivative of y with respect to x*.

To distinguish it from the letter d, ∂ is sometimes pronounced "del" or "partial" instead of "dee".

Integrals

The reverse process of differentiation is called *antidifferentiation*.

The *integral over x of a real-valued function f(x)*, is written as

$$\int f(x) dx.$$

The *integral sign* \int represents integration. The dx indicates that we are *integrating over x*; dx is called the variable of *integration*. The expression to be integrated is called the *integrand*.

Because there is no domain specified, the integral is called an *indefinite integral*.

When integrating over a specified domain, we speak of a *definite integral*.

$$\int_D f(x) dx, \quad \int_a^b f(x) dx$$

or

Here we are integrating over a domain D where the domain is an interval $[a, b]$ of x;

The domain D or the interval $[a, b]$ is called the *domain of integration*.

This is said as *the integral from a to b of f(x) dx*