**SLOPE**

The slope of a line in the plane containing the *x* and *y* axes is generally represented by the letter *m*, and is defined as the change in the *y* coordinate divided by the corresponding change in the *x* coordinate, between two distinct points on the line. This is described by the following equation:



(The Greek letter *delta* "Δ", is commonly used in mathematics to mean "difference" or "change".)

Given two points (*x*1,*y*1) and (*x*2,*y*2), the change in *x* from one to the other is *x*2 − *x*1 (*run*), while the change in *y* is *y*2 − *y*1 (*rise*). Substituting both quantities into the above equation generates the formula:



The formula fails for a vertical line, parallel to the y axis, where the slope can be taken as infinite, so the slope of a vertical line is considered undefined.

**FACTORIAL**

In mathematics, the **factorial** of a [non-negative integer](http://en.wikipedia.org/wiki/Non-negative_integer) *n*, denoted by *n*!, is the [product](http://en.wikipedia.org/wiki/Product_%28mathematics%29) of all positive integers less than or equal to *n*. For example,



## Limit of a function

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |

Suppose f(x) is a real-valued function and c is a real number. The expression



means that f(x) can be made to be as close to L as desired by making x sufficiently close to c. In that case, the above equation can be read as "the limit of f of x, as x approaches c, is L".

**Differentiation** is a method to compute the rate at which a dependent output *y* changes with respect to the change in the independent input *x*. This rate of change is called the **derivative** of *y* with respect to *x*. In more precise language, the dependence of *y* upon *x* means that *y* is a function of *x*. This functional relationship is often denoted *y* = *f*(*x*), where *f* denotes the function. If *x* and *y* are [real numbers](http://en.wikipedia.org/wiki/Real_number), and if the [graph](http://en.wikipedia.org/wiki/Graph_of_a_function) of *y* is plotted against *x*, the derivative measures the [slope](http://en.wikipedia.org/wiki/Slope) of this graph at each point.

The simplest case is when *y* is a [linear function](http://en.wikipedia.org/wiki/Linear_function) of *x*, meaning that the graph of *y* divided by *x* is a straight line. In this case, *y* = *f*(*x*) = *m* *x* + *b*, for real numbers *m* and *b*, and the slope *m* is given by



where the symbol Δ (the uppercase form of the Greek letter Delta) is an abbreviation for "change in."

In Leibniz's notation, such an infinitesimal change in *x* is denoted by *dx*, and the derivative of *y* with respect to *x* is written



suggesting the ratio of two infinitesimal quantities. The above expression is read as "the derivative of *y* with respect to *x*", "d y by d x", or "d y over d x".

**Solving Simple Differential Equations**

These are equations where dy/dx is in terms of x.

In these situations we just use regular integration to find the original equation.

***Example:***

Find the equation of the graph whose gradient,



**General and Particular Solutions**

Having done our **integration** we get an expression that includes the constant '+ c'.

If we know one point we can find c, and this will give us a **particular solution**.

If we do not know a point on the graph then we cannot find c and we get a **general solution**.

***General Solutions***

In the example above we found a general solution y = x2 + 2x + c. To illustrate a general solution we draw a **family of curves** on a coordinate grid, each graph representing a different value for c. The family of curves for y = x2 + 2x + c is:



***Particular Solutions***

A **Particular Solution**, (or **Particular Integral**), is a specific solution to the question that is found using an extra piece of information - one point that lies on the graph.

For instance, if the graph y = x2 + 2x + c contains the point (-2, 3), then we know that when x = -2, y = 3.

This gives us:

4 − 4 + c = 3

Therefore:

c = 3 and the particular solution is y = x2 + 2x + 3.