II. Non-linear functions.

A linear function varies by its domain at a constant rate. Therefore, the overall rate of feature shift is the same as the level of function change in any situation.

Nevertheless, in the case of non-linear processes, the rate of change ranges from point to point. The variation's existence is dependent on the function's design.

The frequency of function change at a given point is known as a derivative of that function.

What is Differentiation?

Differentiation can be defined as a derivative of independent variable value and can be used to calculate features in an independent variable per unit modification.

Let,

y = f(x) be a function of x.

Then, the rate of change of "y" per unit change in "x" is given by,

$$\frac{dy}{dx}$$

If the function f(x) undergoes an infinitesimal change of h near to any point x, then the derivative of the function is depicted as

$$\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$$

When a function is depicted as y = f(x),

Then the derivative is depicted by the following notations:

D(y) or D$f(x)$ is called Euler's notation.

$\dfrac{(dy)}{(dx)}$ is known as Leibniz’s notation.

F’(x) is known as Lagrange’s notation.

Differentiation is the method of evaluating a function's derivative at any time.

Differentiation Rules:

Some of the fundamental rules for differentiation are given below:

Sum or Difference Rule:

When the function is the sum or difference of two functions, the derivative is the sum or difference of derivative of each function, i.e.

If f(x) = u(x) ± v(x), then f’(x) = u’(x) ± v’(x)

Product Rule:

When f(x) is the sum of two u(x) and v(x) functions, it is the function derivative,

If If f(x) = u(x) x v(x),

Then f’(x) = u’(x) x v(x) + u(x) x v’(x)

Quotient Rule:

If the function f(x) is in the form of two functions u(x) / v(x), the derivative of the function can be expressed as:

If f(x) = $\dfrac{u(x)}{v(x)}$,

Then f’(x) = $\dfrac{u'(x)\times v(x)-u(x)\times v'(x)}{[v(x)]^2}$

Chain Rule:

If y = f(x) = g(u),

And if u = h(x)

Then,

$\dfrac{dy}{dx}$ = $\dfrac{dy}{du}$ X $\dfrac{du}{dx}$

Here is a differentiation theorem collection of students so that they can turn to them to solve differential equations related problems. Higher level mathematics is one of the most important topics. The general depiction of the derivative can be expressed as $\frac{du}{dx}$.

This list of formulas contains derivatives for constant, polynomials, trigonometric functions, logarithmic functions, hyperbolic, trigonometric inverse functions, exponential, etc. There are a number of examples and issues in classes 11 and 12 courses, which can be easily addressed by students.

Differentiation Formulas:

Differentiation is a method to find the rate of change of a function depending upon its variable or in brief the derivative of the function which is the frequency of change of function. These functions can be either linear or nonlinear depending upon the nature of slope between the points.In linear ones the slope is constant but in nonlinear ones it varies.

Let, y = f(x) be a function of x.

Then, the rate of change of “y” per unit change in “x” is given by, $\frac{dy}{dx}$

The differentiation formulas are those which help in solving all problems related to differentiation and its equations which may include derivatives of trigonometric functions, logarithmic functions to basic functions. They form the basis of the most important section of mathematics which is calculus. This is an easy scoring chapter. It lays the concrete foundation for the vast and advanced concepts of calculus. This concept not only helps the students to score high marks in maths but also in physics and chemistry as well.

The differentiation formulas are based on a set of rules. They are sum or difference rule, product rule, quotient rule, chain rule. Separation formulas are some of the most important differentiation formulas. Few important ones are enlisted below:

If f(x) = tan(x), then f’(x) = $\sec^2(x)$

If f(x) = cos(x) , then f’(x) = - sinx

If f(x) = sin(x) , then f’(x) = cosx

If f(x) = ln(x) , then f’(x) = $\frac{1}{x}$

If f(x) = ex(x) , then f’(x) = ex(x)

If f(x) = xn, then f’(x) = nxn−1

Where n is any fraction or integer.

If f(x) = k , then f’(x) = 0

Where, k is a constant.

Differentiation Formulas for Trigonometric Functions:

The definition of trigonometry is the interaction of angles and triangle faces. We have 6 major ratios here example, sine, cosine, tangent, cotangent, secant and cosecant. Based on these ratios, you must have learned basic trigonometric formulas. Now let's see the equations of trigonometric functions derivatives.

$\frac{d}{dx}$(sin x) = cos x

$\frac{d}{dx}$(cos x) = - sin x

$\frac{d}{dx}$(tan x) = sec²x

$\frac{d}{dx}$(cot x) = - cosec²x

$\frac{d}{dx}$(sec x) = secx tanx

$\frac{d}{dx}$(cosec x) = -cosecx cotx

$\frac{d}{dx}$(sinh x) = coshx

$\frac{d}{dx}$(cosh x) = sinhx

$\frac{d}{dx}$(tanh x) = sech²x

$\frac{d}{dx}$(coth x) = - cosec²x

$\frac{d}{dx}$(sech x) = sec²x tanhx

$\frac{d}{dx}$(cosech x) = - cosechx cotx

Differentiation Formulas for Inverse Trigonometric Functions:

Inverse equations of trigonometry are reversed proportions of trigonometry. Look at the equations of derivatives of the inverse trigonometric function.

$\frac{d}{dx}\ [\sin^{-1} x]$ = $\frac{1}{\sqrt{1-x^2}}$

$\frac{d}{dx}\ [\cos^{-1} x]$ = $\frac{1}{\sqrt{1-x^2}}$

$\frac{d}{dx}\ [\tan^{-1} x]$ = $\frac{1}{\sqrt{1+x^2}}$

$\frac{d}{dx}\ [\cot^{-1} x]$ = -$\frac{1}{\sqrt{1+x^2}}$

$\frac{d}{dx}\ [\cos^{-1} x]$ = -$\frac{1}{|x\ |\ \sqrt{x^2-1}}$

$\frac{d}{dx}\ [\cos^{-1} x]$ = -$\frac{1}{|x\ |\ \sqrt{x^2-1}}$

Differentiation Formulas List:

In all the formulas below, f' means

$\frac{d[f(x)]}{dx}$ = f'(x) and g' means $\frac{d[g(x)]}{dx}$ = g'(x).

Both f and g are the functions of x and differentiated with respect to x.

We can also represent the above equation as:

$\frac{dy}{dx} = D_x\, y$

Some of the General Differentiation Formulas are:

Power Rule:

$\frac{d}{dx} x^n = n\, x^{n-1}$

The derivative of a constant, a:

$\frac{d}{dx}$ a = 0

Derivative of a constant multiplied with function f:

$\frac{d}{dx}$ (a.f) = af'

Sum Rule:

$\frac{d}{dx}$ (f ± g) = f' ± g'

Product Rule:

$\frac{d}{dx}$ fg = fg' ± gf'

Quotient Rule:

$\frac{d}{dx} \frac{f}{g} = \frac{gf' - fg'}{g^2}$

Other Differentiation Formulas:

$\frac{d}{dx} [a^x] = a^x \ln a$

$\frac{d}{dx} [e^x] = e^x$

$\frac{d}{dx} log_x^a$ = 1/(lna)x

$\frac{d}{dx}$ (ln x) = $\frac{1}{x}$