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Differential Equation, Maths, Real Life

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Abstract –Differential equation is very important branch of applied mathematics since 17 centuary . In mathematics history of differential equation traces the development of differential equation from calculas, itself independently invented by Isaac Newton and German sciencetist Gottfried Leibnitz,game theoretic model also can solve by this,graphical intereference of analyzing data and creating browser data also come from differential part.Now the calculas part is not be limited to maths and solving problem but also be very use full part of real life as it helps in daily routine to medical life.In this we will learn about differential equation ,types and use in real life.

Key Words: Differential Equation, types, ral life example

1. INTRODUCTION

History of Differential Equation:

In 1692 **James Bernoulli** was aware about concept of iIntegrating, the homogeneous differential equation of the first order, and not long afterwards reduced the degree to first order and thus he got the idea of the problem of integrating a linear equation of the first order.

Differential equation was used first by the mathematician Leibniz, the Bernoulli brothers, and others from the 1680s, not long after Newton's 'fluxional equations' in the 1670s. Differential equations are have some difference from ordinary equations of mathematics, in that in addition to variables and constant there are more than one differential terms are involved

Ordinary differential equations applications in real life are used to find out the speed and distance or flow of current, motion of an martial wether solid or liquid form, like a motion of pendulum, ocean waves, to explain thermodynamics concepts. Also, in medical terms, they are used to check the bacterial decay ,growth of population using graphical representation

General Differential Equations. Consider the equation **y′=3x^3**, which is an example of a differential equation because it includes a derivative. There is a relationship between the independent variables x and dependent variable y:y is an dependent function on x. Furthermore, the left-hand side of the equation i.e y' is the derivative of y..

1.1 About Mathematicians:

Gottfried Leibnitz: Leibniz (or Leibnitz) introduced a standard form of linear differential equation of the first order and first degree.

$$\frac{dy}{dx} + P.y = Q$$

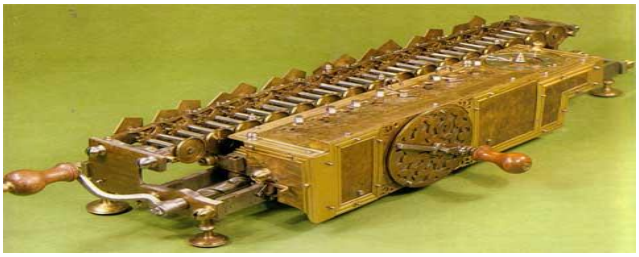
. It is defined in terms of two variables and . In this equation P and Q, and are the functions in terms of a variable x.The solution of the linear differential equation is given by

Where IF stands for integrating factor and it is

$$y.IF = \int Q.IF\ dx + C$$

given by IF=$e^{\int P.dx}$

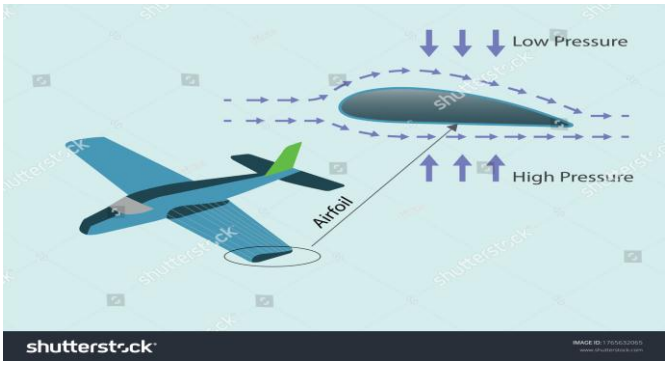
he gives the notation of calculus differential as well as the integration as we are using that in our daily mathematical problems. The present day , though he never be supportive of the concept that "derivative as a limit". His philosophy ideas provide the radical changes and he introduced first and early calculating machine which shown in below fig.



Bernoullies Differential Equation:

$$\frac{dy}{dx} + P.y = Q.y^n$$

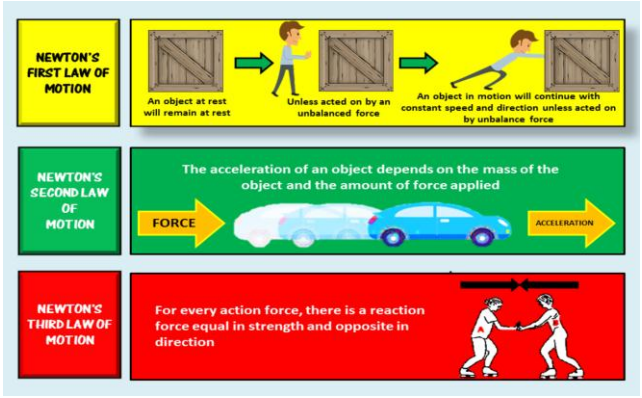
It is a modified version of the Leibnitz equation, which overcomes the disadvantage of linear differential equations, although when solved it will have to be reduced to linear form. A practical example of Bernoulli's principle is lift generated by the aircraft's wings. The rounded shape and slight inclination of the wings allow air to move faster over the top of the wing than below it. As a result, the top pressure is lower, allowing an upward force to act on the wing so it flies smoothly.



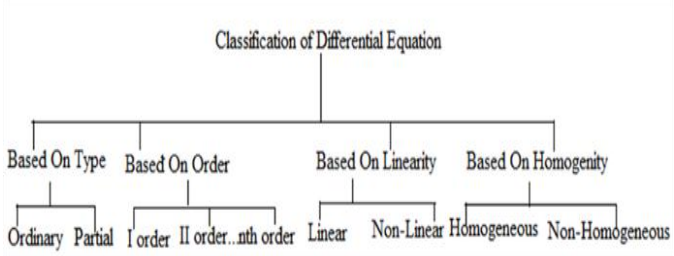
Method of Fluxion:

Fluxion is a word or term that Newton used instead of derivative. He first gives the idea about this method at Woolsthorpe Manor at the time of the closing of Cambridge during the Great Plague of London from 1665 to 1667, but did get any chance to discuss about his findings , like this there are many which unfortunately became the "Mathematical Principal Natural Philosphy" were articulate at this time but it was not disclosed to the world from Newton's discoveries treasure which he had not shown to the world.. Gottfried Leibniz shown and shows Newton wizard to the whole world. In this book Newton's three laws are discuss

In the first law of Newton is that , an object will be on the same position and will not change forever unless a force acts on it. In the second law, the force is directly proportional to its mass times its acceleration. In the third law, two equal and opposite forces attract each other..



Types of differential equation:



Differential equation classified on the basis of **1)Based on type:**a)Ordinary differential equation:It is an equation of one more function of one independent variable and its derivative.

For example

$$\frac{dy}{dx} = x^2 + 1$$

Real life application of above type is momentum of pendulum, motion of electricity in medical field growth of diseases in graphical representation based on this. b)Partial differential equation: a mathematical equation that involves two or more independent variables and function which is dependent on those independent variables and partial derivatives of the unknown function with respect to the independent variables. Fluid mechanics ,heat transfer and electromagnetic theory are some of real life example which can be solved by formulating equation based on partial.

2) Based on Linearity:

a)Linear differential equation:

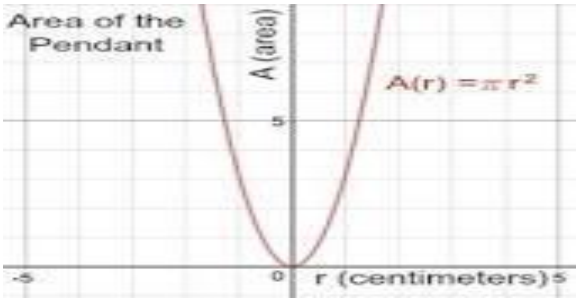
A linear equation of differential form, with more than one term which consist derivatives of the dependent variable with respect to one or more independent variables is known as a linear differential equation.

This is also called Gottfried Leibnitz equation (1.1)

b)Non Linear differential Equation:

If the equation is not linear then it is non linear differential equation. There are plenty of example for this one of the most common is conversion of energy from mass, falling of objects acceleration is also good on this type. X^2 + 1 = 0, 4x + 3y = 5, this is the example of nonlinear equations, because equation 1 has the highest degree of 2 and the second equation has variables x and y. For example,

if you want to make the of radius 2cm p, then you can do it by calculating area A(2) We see that when the radius is 2 centimeters, the area of the pendant is approximately12.56 square centimeters. This is a best example of using non-linear functions in the real world.



Pendant (non- linear differential equation)

3) Based on homogeneity: a)Homogeneous Equation

A first-order differential equation is said to be homogeneous $if\ u(x,y)\ and\ v(x,y)$ are both homogeneous functions of the same degree. Consider the following functions in x and y,

$U_1(x,y) = 4x - 6y$

$U_1(x,y) = x2 + 16xy + 5y2$

$U_1(x,y) = tan(x/y)$

$U_1(x,y) = cosx + siny$

To check about homogeneous function

Put $x = vx\ and\ y = vy$

$U_1(vx,vy) = 4(vx) - 6(vy) = v(4x - 6y) = VU_1(x,y)$

$U_2(vx,vy) = v2x2 + 16(vx)(vy) + 5v2y2 = v2(x2 + 16xy + 5y2) = v2U_2(x,y)$

$U_3(vx,vy) = tan(vx/vy) = v0tan(vx/vy) = v0U_3(x,y)$

$U_4(vx,vy) = cos(vx) + sin(vy) \neq vnU_4(x,y)$

Therefore U_1, U_2, U_3 are the homogeneous function where as U_4 does not satisfy the property of homogeneous.

b)Non-homogeneous function: If function ion is not homogeneous then that function is called non homogeneous function.

4. Conclusion:

As we all know world is not exist without math and in that calculus play a very important role .In this paper we see how the differential equation play a important role not in maths as well as in real life .In this there are different type of differential equation with different real life application example are explained

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