GOVERNMENT DEGREE COLLEGE - LUXETTIPET

DEPARTMENT OF MATHEMATICS

JIGNASA

STUDENT PROJECT REPORT

TOPIC

A STUDY ON APPLICATION OF DERIVATIVES IN DAILY LIFE

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GOVERNMENT DEGREE COLLEGE - LUXETTIPET

CERTIFICATE

This is to certify that the following student team conducted student study project in the topic " **STUDY ON APPLICATION OF DERIVATIVES IN DAILY LIFE** "under the supervision of **N.VENKATARAMANA, Lecturer in Mathematics**, Government Degree College -Luxettipet for the Academic year **2019-2020**

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Title: Application of derivatives in daily life.

Statement: A Study of the application of derivatives in Daily life situation.

Objective: To find the application of derivative in daily life.

- To find the growth rate of population.
- To find the maximum and minimum values of function.
- To find the tangents and normal of a curve.
- To find the gradient at any point of graph etc.

ABSTRACT: - This Project describes about the usefulness of derivatives in real life ISSAAC NEWTON –THE FATHER OF CALCULUS invented the calculus. But anyone knows what made Isaac invent calculus

INTRODUCTION: "dy/dx" means the rate of change of y with respect to rate of change of x. It gives the instantaneous rate of change. "dy/dx" is positive if y increases with increase of x but negative if y decreases with increase of x.

BIRTH of APPLICATION OF DERIVATIVES:

- In Isaac Newton's day, one of the biggest problems was poor navigation at sea.
- Before calculus was developed, the stars were vital for navigation.
- Shipwrecks occurred because the ship was not where the captain thought it should be. There was not a good enough understanding of how the Earth, stars and planets moved with respect to each other.
- Calculus (differentiation and integration) was developed to improve this understanding.
- Differentiation and integration can help us solve many types of real world problems.

- We use the derivative to determine the maximum and minimum values of particular functions (e.g. cost, strength, amount of material used in a building, profit, loss, etc.).
- Derivatives are met in many engineering and science problems, especially when modelling the behaviour of moving objects.
- Our discussion begins with some general applications which we can then apply to specific problems.

USES :

1. It is used in ECONOMIC a lot, calculus is also a base of economics.
2. It is used in history, for predicting the life of a stone.
3. It is used in geography, which is used to study the gases present in the atmosphere.
4. It is mainly used by pilots to measure the pressure in the air.
5. It is also used in so many different fields such as Biology, Mathematics, Chemistry, Physics, and Engineering etc.

The Definition of the Derivative:

We saw that the computation of the slope of a tangent line, the instantaneous rate of change of a function, and the instantaneous velocity of an object at $x=a$ $x=a$ all required us to compute the following limit.

$$\lim_{x \to a} \frac{f(x)-f(a)}{x-a}$$

We also saw that with a small change of notation this limit could also be written as,

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

The derivative of $f(x)$ $f(x)$ with respect to x is the function $f'(x)$ $f'(x)$ and is defined as,

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

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Example : Find the derivative of the following function using the definition of the derivative.

$$f(x)=2x^2-16x+35$$

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Solution :

By the definition of the derivative.

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

$$=\lim_{h\to 0}\frac{2(x+h)^2-16(x+h)+35-(2x^2-16x+35)}{h}$$

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

$$=\lim_{h\to 0}\frac{2(x+h)^2-16(x+h)+35-(2x^2-16x+35)}{h}$$

Now, we know from the previous chapter that we can't just plug in $h=0$ $h=0$ since this will give us a division by zero error. So we are going to have to do some work. In this case that means multiplying everything out and distributing the minus sign through on the second term. Doing this gives,

$$f'(x)=\lim_{h\to 0}\frac{2x^2+4xh+2h^2-16x-16h+35-2x^2+16x-35}{h}$$

$$=\lim_{h\to 0}\frac{4xh+2h^2-16h}{h}$$

$$f'(x)=\lim_{h\to 0}\frac{2x^2+4xh+2h^2-16x-16h+35-2x^2+16x-35}{h}$$

$$=\lim_{h\to 0}\frac{4xh+2h^2-16h}{h}$$

$$f'(x) = \lim_{h \to 0} \frac{h(4x + 2h - 16)}{h}$$

$$= \lim_{h \to 0} 4x + 2h - 16$$

$$= 4x - 16$$

$$f'(x) = 4x - 16$$

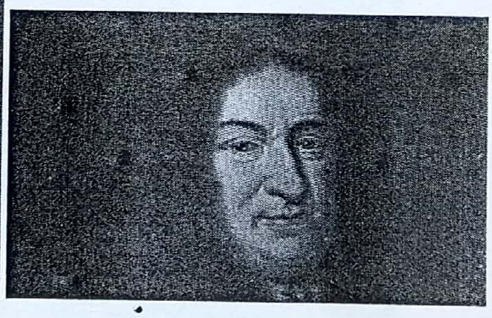
HISTORY:

Modern differentiation and derivatives are usually credited to Isaac Newton and Gottfried Leibnitz.

They developed the fundamental theorem of calculus in the 17^{th} century this related differentiation in ways which revolutionised the methods for computing areas and volumes.

However Newton's work would not have been possible without the efforts of Isaac barrow who began early development of the derivative in the 6^{th} century.

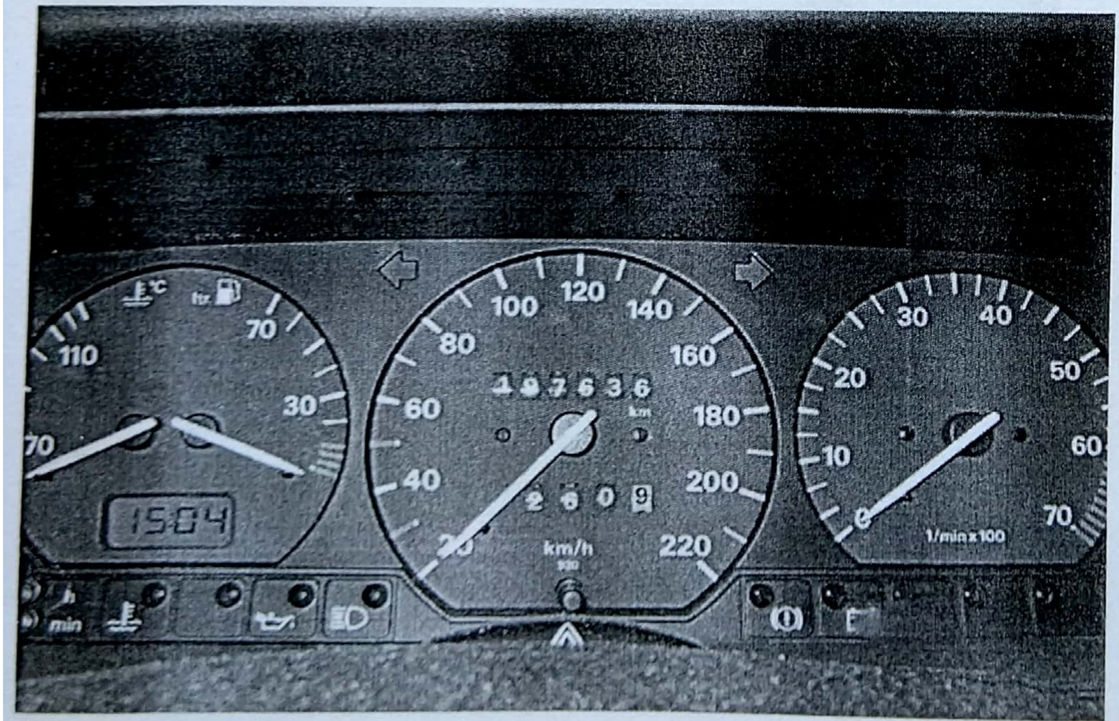




REAL LIFE APPLICATIONS OF DERIVATIVES:

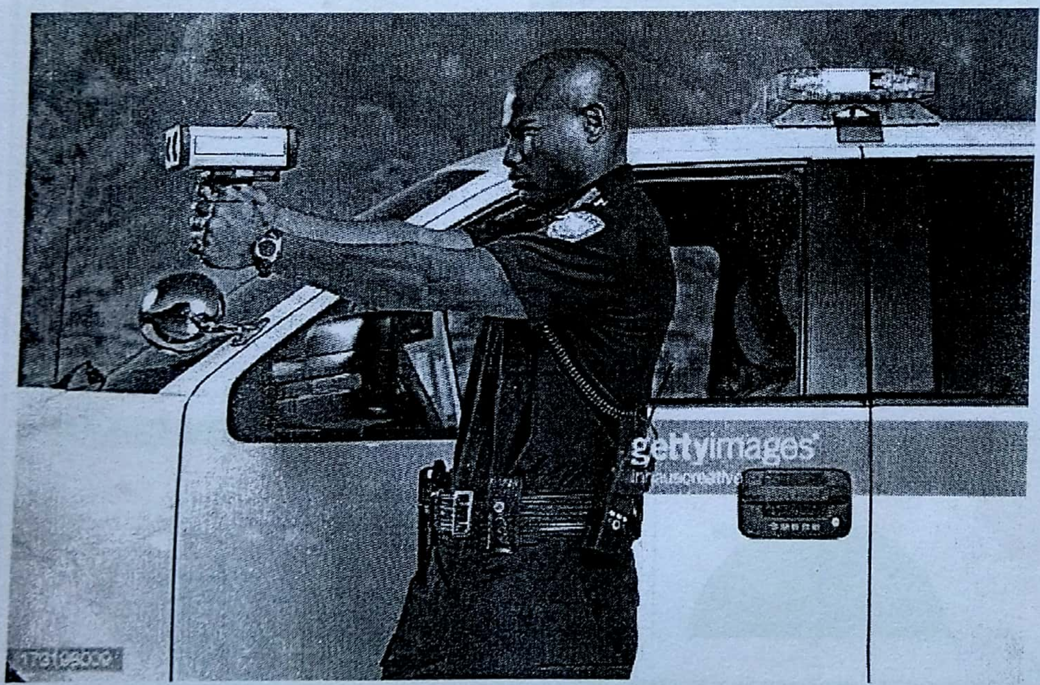
AUTOMOBILES

In an automobiles There is always an adometer and a speedometer those two gauges work in tandem and allow the driver to determine his speed and his distance that he has travelled electronic versions of these gauges simply use derivatives to transform the data sent to the electronic mother board from the fires to miles per hour (mph) and distance (km).



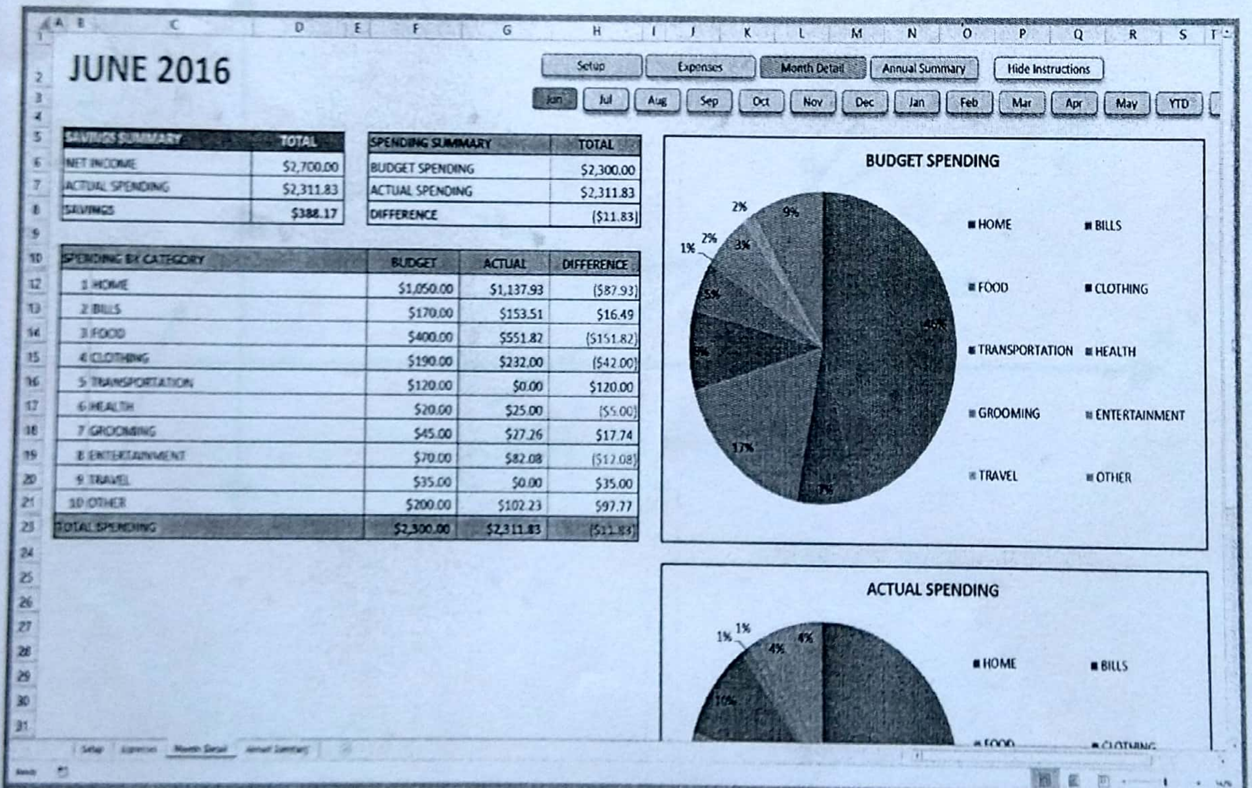
Radar Guns:

All the police officers who use radar guns are actually taking advantage of the easy use of derivative when a radar gun is pointed and fired at your care on the highway the gun is able to determine the time and distance at which the radar was able to hit a certain section of your vehicle with the use of derivative it is able to calculate the speed at which the car was going and also report the distance that the car was from the radar gun



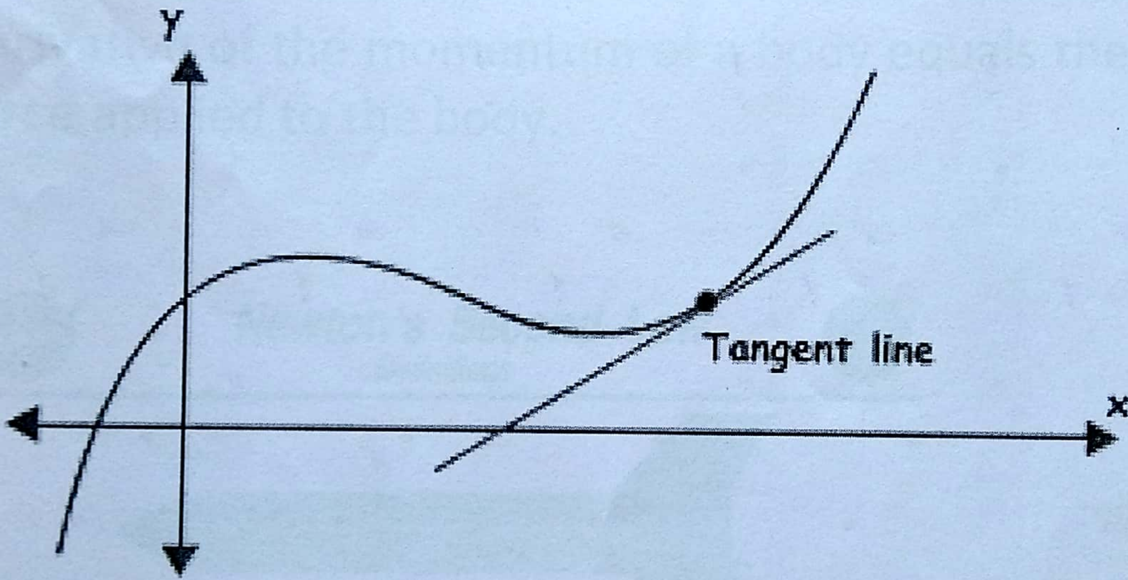
Business :

In the business world there are many applications for derivatives one of the most important applications is when the data has been charted on graph or data table such as excel once it has input, the data can be graphed and with the applications of derivatives you can estimate the profit and lass point for certain ventures.



GRAPHS:

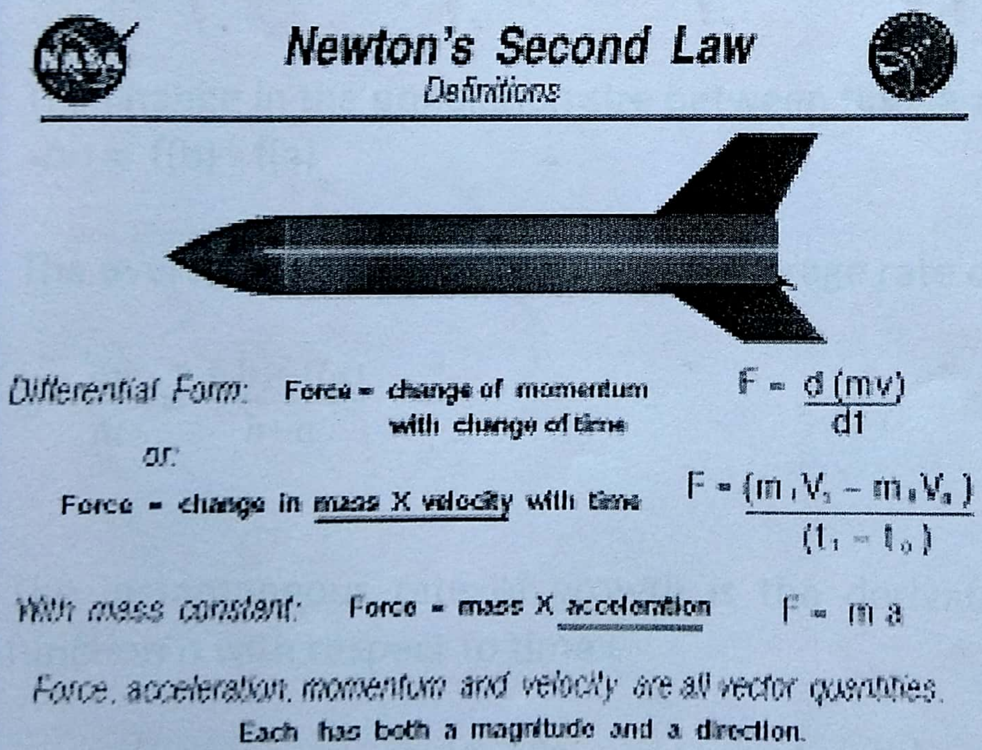
The most common application of derivative is to analyse graphs of data that can be calculated from many different fields using derivative one is able to calculate the gradient at any point of a graph.



DERIVATIVES IN PHYSICS:

In physics the derivative of the displacement of a moving body with respect to time is the velocity of the body and the derivative of velocity with respect to time is acceleration.

Newton's second law of motion states that the derivative of the momentum of a body equals the force applied to the body.



DERIVATIVES IN BIOLOGY:

Population Growth Today we will discuss ways to model the growth of a population, be it a population of people, animals, bacteria, or whatever. Absolute Growth Rate Let n= f(t) represent the population at time t.

The absolute growth rate is the rate of change of the population, or f '(t). Now we can only use this if a formula is given for f(t). However, we can use as an approximation the average absolute growth rate from time t = a to t = b by dividing the change in the population by the length of time: (This is just like finding the average velocity by dividing distance travelled by time.)

The change in the population size between time a and b

$\Delta n = f(b) - f(a)$

The average rate of growth is then is average rate of growth

is $\frac{\Delta n}{\Delta t} = \frac{f(b)-f(a)}{b-a}$

The instantaneous rate of growth is the derivative of the function n with respect to time t

Growth rate = $\lim_{\Delta t \to 0} \frac{\Delta n}{\Delta t} = \frac{dn}{dt}$

DERIVATIVES IN ECONOMICS:

Cost Function: The total cost C of producing and marketing x units of a product depends upon the number of units (x). So the function relating C and x is called Cost-function and is written as C = C (x). The total cost of producing x units of the product consists of two parts (i) Fixed Cost (ii) Variable Cost i.e. C (x) = F + V (x) Fixed Cost : The fixed cost consists of all types of costs which do not change with the level of production. For example, the rent of the premises, the insurance, taxes, etc.

Variable Cost: The variable cost is the sum of all costs that are dependent on the level of production. For example, the cost of material, labour cost, cost of packaging, etc.

Demand Function: An equation that relates price per unit and quantity demanded at that price is called a demand function. If 'p' is the price per unit of a certain product and x is the number of units demanded, then we can write the demand function as x = f (p) or p = g (x) i.e., price (p) expressed as a function of x.

Revenue function: If x is the number of units of certain product sold at a rate of Rs. 'p' per unit, then the amount derived from the sale of x units of a product is the total revenue. Thus, if R represents the total revenue from x units of the product at the rate of Rs. 'p' per unit then R= p.x is the total revenue Thus, the Revenue function R (x) = p.x. = x .p (x)

Profit Function: The profit is calculated by subtracting the total cost from the total revenue obtained by selling x units of a product. Thus, if P (x) is the profit function, then

$P(x) = R(x) - C(x)$

Break-Even Point: Break even point is that value of x (number of units of the product sold) for which there is no Profit or loss. i.e. At Break-Even point

$P(x) = 0$ or $R(x) - C(x) = 0$ i.e. $R(x) = C(x)$

Marginal cost:

Marginal cost = $\frac{dc}{dx}$

Marginal Revenue:

Marginal Revenue = $\frac{dR}{dx}$

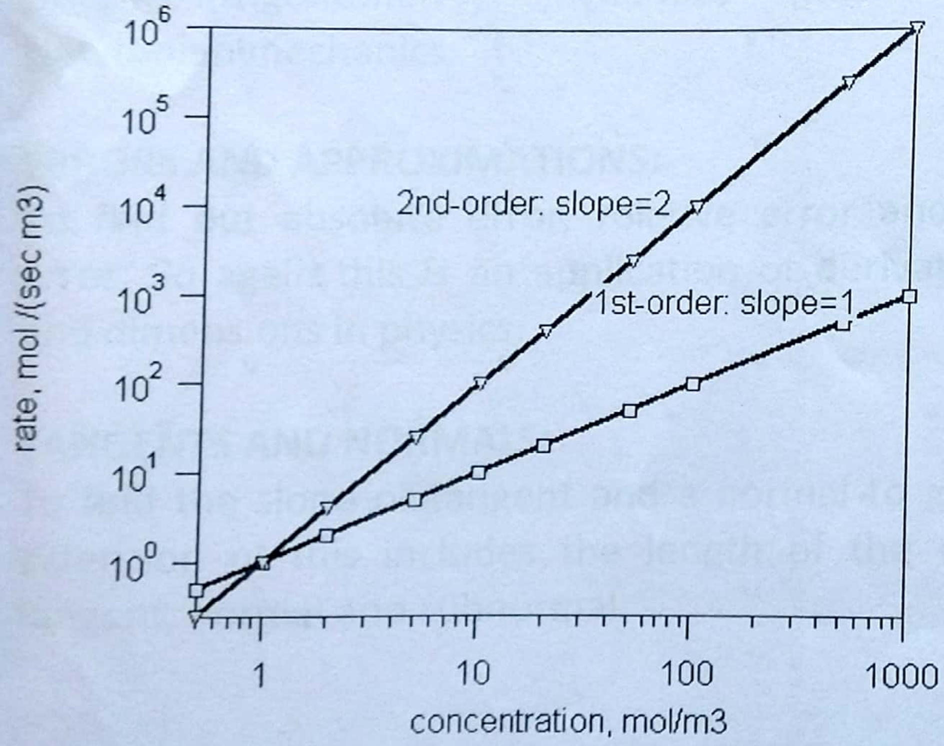
The derivative of the profit function is the marginal profit

Marginal profit = $\frac{dp}{dx} - \frac{dc}{dx}$

DERIVATIVES IN CHEMISTRY:

One use of derivatives in chemistry is when you want to find the concentration of an element in a product.

Derivative is used to calculate the rate of reaction and compressibility in chemistry.



APPLICATION OF DERIVATIVES IN ENGINEERING:

Engineering, Electrical engineering and Civil engineering. The application of derivatives is also used in mechanical.

SOME OTHER APPLICATIONS OF DERIVATIVES:

Derivatives are also used to calculate

- Rate of heat flow in geology.
- Rate of improvement of performance in psychology.
- Rate of the spread of a rumour in sociology.

RESEARCH METHODOLOGY:

We used Methodology of Research is

Survey Method.

DATA COLLECTION:

Data was collected by the internet and some reference books of applications of derivatives.

INTERNET:

- Google website
- Different university websites

REFERENCE BOOKS:

- Differential Calculus - Shanti Narayan & Dr. P.K Mittal
- Application of derivatives - Intermediate text book
- Differential calculus - Telugu academy

Data Analysis

Whatever we collected the data and analysing the data, finally we found that many application of derivatives in many fields in real life situations.

FINDINGS:

We are found that so many applications of derivatives in such fields like engineering, Maths, physics, biology, economics and business etc.

CONCLUSION:

Derivatives are constantly used in everyday life to help measure how much something is changing they are used by the government in population census, various types of sciences and even in economics knowing how to use derivatives, when to use them and how to apply those in everyday life can be a crucial part of any profession. So learning early is always a good thing.