Application of Derivatives in Real Life

Kartik Singh(16225); Akshat Sharma(16194); Govind Rajput(16212) & Devesh Kasturia(16205)
Students- Dronacharya College of Engineering

ABSTRACT: - *This paper 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??? Here in this paper there are all the answers of your questions.*

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 modeling the behavior 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.

And Many More

APPLICATIONS OF DERIVATIVES

We've spent a lot of time in this course studying derivatives. While derivatives are interesting from a mathematical perspective, their true power comes from their applications to problems in the real world. There are countless areas where derivatives are used, but some of the most important are mathematical physics, biology and economics. We'll list some specific examples here. These will not be covered on the final, and they are simply designed to give you a taste of how calculus is used in the real world.

1. Biology

To model population growth, ecosystems, the spread of disease and various other phenomena. The area that we will focus on here is population growth.

Q. Consider Patient Zero became infected on day 0, and each person per day gets infected afterward. This caused the population of infected to double every day.

So, the population at time t was given by P(t) = 2^t (exponential function),where t is the no. of day.

Finding rate of growth= P' (t) = (2^t) log2 i.e. a DIFFERENTIAL equation

(Though the above model cannot be stated ideal as we are not considering those who dies due to the infection thus a better model can be formed using differential equation that considers all the other points)

2. Physics

We've already seen some applications of derivatives to physics. In particular, we saw that the first derivative of a position function is the velocity, and the second derivative is acceleration.

Q. Suppose a cubic crystal is growing so that the side changes at the rate of 10mm per second when the side length is 20 mm. If I want to know how fast the volume of the cube is growing at that time, I must use the equation V=x^3 and take the implicit derivative with respect to t and solve for dV/dt.

(A cubic cell is the one that has all its sides equal and at right angle to each other)

3. ECONOMICS

In particular, we'll show how optimization (finding minimum and maximum values) can be useful in economics.

Q. Consider we need to maximize profit. Suppose that p(x) is the price per unit that a company can charge to sell x units. The total revenue gained by selling this particular product is R(x) = xp(x) If we let C(x) denote the cost of manufacturing and selling x units, then the profit made by selling x units is P(x) = R(x)-C(x).

To maximize this, we need to find the critical points of the function i.e. differentiate it….P'(x) so

1. If P'(x) <0 =>PROFIT

2. If P'(x)>0 =>LOSS

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