Class – XII
Lesson Plan 4

Topic: Application of Derivatives

Brief Description of the lesson:

In this chapter, students will study about various applications of derivatives such as rate change of bodies, increasing /decreasing functions, maxima and minima and simple problem based on application of derivatives.

Objectives:

I - Specific Objectives:

To enable the students to understand:
S1 Rate as a measure (**Knowledge/Recalling)**
S2 Increasing and decreasing functions **(Understand/Classifying)**
S3 Maxima and minima **(Apply/Implementation)**
S4 Differentiate Between Rate of change, Increasing and decreasing and Maxima and minima **(Analysis)**

II - Behavioural Objectives:

By understanding and solving variety of problems, students will attain following behavioural objectives:
B1 Imagination **(Apply/Implementation)**
B2 Systematic approach **(Apply/Implementation)**
B3 To handle real life situation **(Apply/Implementation)**

Process / Activities:

ACT1 To understand the concept of maxima-minima, with the help of graphs of different functions like linear, quadratic, cubic, rational, trigonometric, logarithmic, exponential. **(Understand/Classifying)**

ACT 2 To calculate profit and loss in a business using graphs. **(Apply/Implementation)**

Skills:

1) Analysis
2) Problem solving
3) Application

Assessment:

Assessment of activity will be done based on the following questions
A1 (a) Find the intervals in which the function $f(x) = 2x^3 - 9x^2 + 12x + 15$ is strictly or strictly decreasing. **(Understand/Classifying)**

A2 (b) Find the turning points of the following functions and distinguish between them. Also find the local maximum and minimum values of the functions:
(i)$f(x) = 2x^3 - 21x^2 + 36x - 20$ (ii)$f(x) = x^3 - 3x^2 + 3x$ **(Apply/Implementation)**
A3 (c) An edge of a variable cube is increasing at the rate of 3 cm/s. How fast is the volume of the cube increasing when the edge is 10 cm long? **(Understand/Classifying)**

A4 (d) Using the knowledge of application of derivatives plot the graph of the function $f(x) = 3x^4 + 4x^3 - 12x^2 - 24x + 12$ **(Synthesis)**

Expected Learning Outcomes:

The students would be able to efficiently deal with:
1) Concept of Rate of change of quantities **(Knowledge/Recalling)**
2) Increasing, decreasing, strictly Increasing, strictly decreasing functions **(Understand/Classifying)**
3) finding maximum and minimum value of the function by using first order and second order derivative tests. **(Apply/Implementation)**

Placements of Objectives, Instructional Activities and Assessment:

Topic/Start Date/Assessment					
Knowledge	Understanding	Application	Analysis	Synthesis	Evaluation
S1	S2	S3	S4	A4	
	ACT1	B1			
	A1	B2			
	A3	B3			
		ACT2			
		A2			

REVIEW OF THE LESSON PLAN

(To be done when the lesson gets over)

Problems Faced:

1. Students' lack of understanding of the underlying concepts. Derivatives are a complex topic, and students need to have a solid understanding of the underlying concepts, such as limits, rates of change, and slope, to be able to apply them to real-world problems. If students are struggling with the basics, they will likely have difficulty with the applications.

2. The abstract nature of derivatives. Derivatives are a relatively abstract concept, and can be difficult for students to visualize. This can make it challenging for them to understand how to apply derivatives to real-world situations.

3. The difficulty of word problems. Word problems involving derivatives can be challenging, even for students who have a good understanding of the underlying concepts. This is because

students need to be able to translate the word problem into mathematical terms, and then apply the appropriate derivative rule.

4. Lack of time. Derivatives are a complex and vast topic, and it can be difficult to cover all the material in the allotted time.

Success: about 80% of the students understand the topic better and have ability to express it properly.

Failure: about 20 % of students not be able to solve a particular set of questions (relatively difficult word problems).

Real Learning Outcomes: Students were able to

1. understand the different applications of derivatives. This includes understanding how to use derivatives to find rates of change, extrema(maxima-minima) and increasing-decreasing functions.

2. apply derivatives to solve real-world problems (easier problems).

3. use derivatives to make informed decisions. This includes understanding how to use derivatives to optimize profits, minimize costs, and maximize efficiency. (relatively easier topic of the chapter).

4. to think critically about the concepts of derivatives and their applications.

Students Response/Participation: Students appreciate the opportunity to learn about a complex topic in a meaningful and engaging way. Students were able to apply the basics of differentiation. But faced difficulty in word problems and few problems which require deeper understanding of the graphs so students were unwilling to solve more word problems but were interested in other types of problems.

Teacher's Learning: Teachers can think about how they can make their teaching more engaging while teaching word problems using real-world examples and applications. When graphs are dealt in this chapter teacher gets more deeper understanding of calculus in general and hence gives an edge to students. Teachers can also think about how they can incorporate more case studies and problem-solving exercises into their curriculum. When students ask questions about derivatives, it can force teachers to think about the topic in a new way. This can help teachers to develop a deeper understanding of the material.

To be incorporated in term 2: More objective type and competency-based questions.