

LESSON PLAN

2020 – 2021

Name of the teacher – KAKALI BAGCHI

Class – xii

No. of Students – 40

Average Age of Students – 14

Duration – 40 mins

Date – 18-7-2018

Subject – Mathematics

Topic – Application of derivative

Today's Topic – Increasing and Decreasing functions

General Objectives – To teach students how to establish the relationship between slope of a function and sign of dy/dx in different sets of numbers.

Special Objectives –

- **Knowledge**- At the end of the lesson the learners will be state Increasing and decreasing functions.
- **Concept** – Justify that there is difference between necessary and sufficient conditions for Monotonicity
- **Application** – Apply the knowledge of Increasing and decreasing functions to solve simple problems like the following:
 - i) Show that $f(x) = x^3 - 15x^2 + 75x - 50$ is an increasing function for all real values of x
 - ii) Find the intervals in which the function $f(x) = \sin x + \cos x$ when x lies between 0° to 360° .
- **Skill** – Apply the knowledge in problems like Tangent, MR and MC

Teaching Aids – Text Book, Board, Marker, Smart Board, Sample Paper and internet for different questions

Previous Knowledge –

- Derivative
- Domain

Method/Approach – As there are diverse learners in a class so teaching methods should involve all the following

- i) Constructivist method of teaching by putting questions
- ii) For visual learners using pictures of graphs in smart board
- iii) For Auditory learners emphasise on explanation
- iv) For read and write learners Do sums on board
- v) For kinaesthetic learners do a small activity

Presentation:

- **Content/Teaching Points** –

- i) To find dy/dx of different functions
- ii) Get values of x for which dy/dx is zero
- iii) Use number line and find disjoint sets with reference to the previous values of x
- iv) Check in which intervals dy/dx is positive or where it is negative and define it as increasing or decreasing respectively.

- **Teacher's Activity-**

- i) Ask questions to check previous knowledge like what is geometric meaning of dy/dx ?
- ii) Find derivative of few algebraic and trigonometric functions like
$$f(x)=2x^3+9x^2+12x+20$$
$$f(x) = \sin x + \cos x$$
$$f(x)= \tan^{-1} (\sin x + \cos x)$$
- iii) Ask students to equate dy/dx with zero and get corresponding values of x
- iv) Split up the given set into few disjoint sets taking previous values of x as lines of demarcation

- v) Ask students to take few arbitrary values present in different intervals and check where dy/dx is positive and where it is negative.
- vi) The teacher will state-The interval where it is positive there the function is increasing and where it is negative there the function is decreasing.
- vii) Diagrammatic presentation and explanation will also be done

- **Student's Activity-**

- i) Finding derivative of different functions
- ii) Following instructions of teachers from step (iii) to (vi)
- iii) Learning outcome will be practised in different sums like

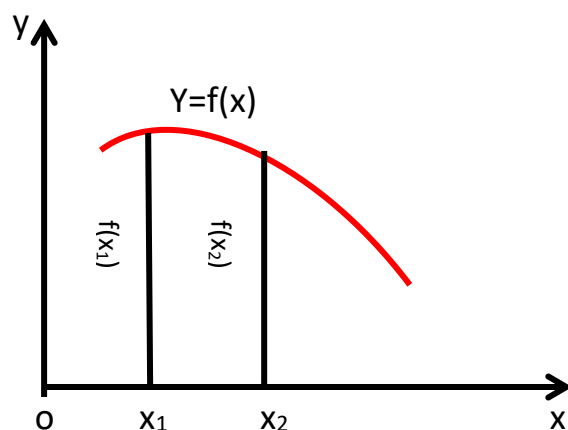
$$f(x)=2x^3+9x^2+12x+20$$

$$f(x) = \sin x + \cos x$$

$$f(x)= \tan^{-1} (\sin x + \cos x)$$
- iv) Activity by ribbon and sticks

- **Blackboard Presentation-**

i)



Here, $x_1 < x_2$ and $f(x_1) > f(x_2)$ hence, the function is decreasing.

- ii) $Y = f(x) = 2x^3+9x^2+12x+20$
 So, $dy/dx= 6x^2+18x+12$
 $=6(x+1)(x+2)$

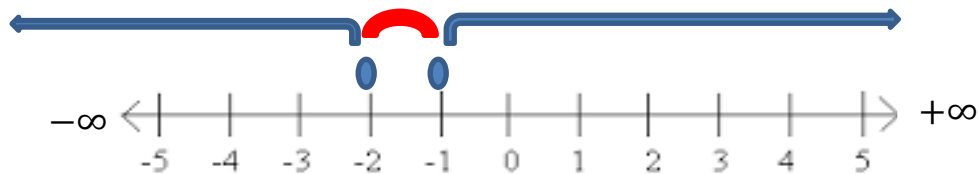
When $dy/dx = 0$ then,

$$6(x+1)(x+2) = 0$$

So, $x = -1, -2$

Set of real numbers is divided into 3 disjoint sets

$(-\infty, -2), (-2, -1), (-1, \infty)$



Factors of dy/dx	Sign in $(-\infty, -2)$	Sign in $(-2, -1)$	Sign in $(-1, \infty)$
6	+	+	+
$x+1$	-	-	+
$x+2$	-	+	+
Sign of dy/dx	+	-	+

So, the function is increasing in $(-\infty, -2) \cup (-1, \infty)$ and decreasing in $(-2, -1)$.

Similar few questions will be solved.

Evaluation-

- Students will be asked to relate this transitional points of $dy/dx=0$ with minima-maxima and parallel property of tangents.
- Special observation and implication will be asked about alternate regions of increasing and decreasing parts of a function

Home Assignment-

Students will be asked to find the regions where the following functions are increasing or decreasing

- $f(x) = 2x^3 - 6x^2 - 36x + 2$
- $f(x) = 5x^3 - 15x^2 - 120x + 3$
- $f(x) = -2x^3 - 9x^2 - 12x + 1$

Signature of Teacher