SAMPLE LESSON: MATHEMATICS

Class: Lower Sixth

Title of Module: Plane Geometry	**Title of Chapter:** Derivatives
Title of Lesson: Differentiation of Implicit functions	**Duration of Lesson:** 100mins

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MATHEMATICS LESSON

SCHOOL: St Benedict Bilingual College Mvolye **Term**: 2

CLASS: Upper Sixth; **Duration**: 100 minutes ; **No. on Roll:** _____; Boys: _____; Girls:_____

MODULE 16: Calculus I

TOPIC: Differentiation

Lesson: Differentiation of Implicit Functions Angle Theorems

Lesson Objectives: At the end of the lesson, the learners should be able to:

- Identify and differentiate implicit functions
- State real life situations where the knowledge of implicit functions is applied

Prerequisite knowledge: Students possess basic knowledge on
Differentiation including chain and product rule, quotient rule as well as differentiation of trigonometric functions.
Motivation: Implicit differentiation is used in many areas of sciences like engineering.

REFERENCES

- A/L Mathematics Teaching Syllabus by Ministry of Secondary Education Cameroon / GCE Board
- Pure Maths by Anucam, 2010 Core Course;
- A/l Maths Made Easy by Ewane 2017

Stages/Duration	Teaching/Learning Activities	Teacher's Activities	Learners' Activities	Learning Points
Introduction **15 mins** **Problem Situation**	**Motivation and verification of pre-requisite knowledge;** Find dy/dx for each of the following i). $y = x^3$ ii). $y = (2x + 1)^5$ iii) $y = \sin(2x)$ iv) $y = x^3 \cos x$ v) $2xy - x^2 + y^2 = 5$	-corrects assignments with students - gives exercises on the board. -organizes the class into groups. -guides students into discovering that they need to go beyond the previous knowledge	-Students go to the board and solve the assignment. -Students sit in groups. - -Student discuss among themselves to find out the way forward.	**Motivation and verification of pre-requisite knowledge;** Find dy/dx for each of the following i). $y = x^3$ ii). $y = (2x + 1)^5$ iii) $y = \sin(2x)$ iv) $y = x^3 \cos x$ v) $2xy - x^2 + y^2 = 5$
Lesson Development **35 mins**	<u>Activity</u> Differentiating $x = y^2$ with respect to x <u>Instructions</u> To differentiate the right hand side let $u = y^2$ and a) Find $\frac{du}{dy}$ b) using $\frac{du}{dx} = \frac{du}{dy}.\frac{dy}{dx}$ find an expression for $\frac{du}{dx}$ c)Hence find $\frac{d}{dx}(y^2)$ in terms of y.	-guides the students into discovering the principle underlining implicit differentiation.	-Students come to the conclusion of how to use implicit differentiation.	<u>Activity</u> Differentiating $x=y^2$ with respect to x <u>Instructions</u> To differentiate the right hand side let $u = y^2$ and a) Find $\frac{du}{dy}$ b) using $\frac{du}{dx} = \frac{du}{dy}.\frac{dy}{dx}$ find an expression for $\frac{du}{dx}$ c)Hence find $\frac{d}{dx}(y^2)$ in terms of y.
Summary **5mins**		-explains -writes summary on the board.	- listen	**$x = y^2$** $\frac{dx}{dx} = \frac{d}{dx}(y^2)$ $1 = 2y\frac{dy}{dx}$ **<u>Definition;</u>** A function can be explicit or implicit.

Stages/Duration	Teaching/Learning Activities	Teacher's Activities	Learners' Activities	Learning Points
		-ask questions	-copy	Explicit functions can be written in the form y= f(x) eg $y=x^2+2y$. and $y=\sqrt{x+1}$ etc While implicit functions are not easily written in the form y= f(x) eg $x^2+y^2+2xy=0$ In the above activity , y^2 is differentiated w.r,t y to have 2y and the result is multiplied by $\frac{dy}{dx}$ **.This process is called IMPLICIT DIFFERENTIATION**
Application Exercises **20mins**	**Exercise 1;** Find dy/dx in the following equations; 1) $2xy - x^2 - y^2 = 5$ 2) $x^2 + xy + y^3 = 8$ 3) Given that y + xsiny = 0 show that $\frac{dy}{dx} = \frac{-siny}{1+xcosy}$ 4) Given that ye^x = sinx. Show that $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 2y = 0$ is an implicit differentiation **Practical exercise 2** Using the balloons given to you, take some time to inflate it and make observations. Given the formula of the volume of a	-writes on the board. -reads -explains	- listen -copy -ask questions	E**xercise 1;** Find dy/dx in the following equations; 1) $2xy - x^2 - y^2 =$ 2) $x^2 + xy + y^3 = 8$ 3) Given that y + xsiny = 0 show that $\frac{dy}{dx} = \frac{-siny}{1+xcosy}$ 4) Given that ye^x = sinx. Show that $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 2y = 0$ is an implicit differentiation **Practical exercise 2** $V = \frac{4}{3}\pi r^3$ $\frac{dr}{dv} = \frac{3}{12}\pi r^2$

Stages/Duration	Teaching/Learning Activities	Teacher's Activities	Learners' Activities	Learning Points
	sphere, V = $\frac{4}{3}\pi r^3$ What happens to the radius when the volume increases?			
Evaluation **15 mins**	Ask oral questions Announcement	Ask oral questions	Answer the questions asked to show proof of lesson mastery	**Assignment** **1)** Given that $y^2 + xy - x^2 = 1$, find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ when x = y = 1 **2)** Given that siny = 2cosx, show that $(\frac{dy}{dx})^2 = 1+3\sec^2 y$
Conclusion **10mins**		-summarizes, write Assignment, and give announcements -roll call. -signs records of work.	- listen -ask questions Answer present or absent	