Math SL EXPLORATION LAB 5

In this assignment, you will be introduced to the concept of a "derived function" and begin to understand its origins and its role.

PART A - The Basics

1. Pick three integers between -10 and 10 and hence, create a quadratic equation ⇒ i.e if you picked -3 and 5 and 9, then your function that you will work with will be $y = -3x^2 + 5x + 9$. Record the equation on the board. Make sure your equation is unique.

2. Graph your parabola in an appropriate view window.

3. Use your TI-84 to draw a tangent line to the parabola at x = -4 (2^{nd} ⇒ Draw ⇒ 5 and then type in -4.) You should now see a tangent line being drawn at x = -4, whose equation will be presented as on the calculator.

4. With respect to the parabola with which you are working ⇒ explain the significance of the slope of the tangent line at this given x value of x = -4.

5. Record this *x* value as well as the slope value in the following data table.

x coordinate	-4	-3	-2	-1	0	1	2	3	4	5
m of tangent										

6. Repeat steps 3 and 5 for each value from x = -3 to x = 5, as indicated on the table above & record each slope value.

7. Now prepare a scatter plot of the data from the table you've just completed. Show me the scatter plot. Again, as a KEY reminder, what does each data point represent on this scatter plot?

8. The scatter plot should look familiar, so use an appropriate strategy to determine the equation of the curve that best fits the data set. Record this equation.

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9. We will now refer to this new equation as a **derived function (DF)** (since we ***derived*** it from multiple tangents slopes of the function we started with). So, on the board, record the equation of your **derived function** next to your original quadratic function.

10. CONNECTIONS ⇒ you should now see some patterns emerging from our class data set that will allow us to make a generalization about how to determine the equation of the **derived function** of ANY quadratic equation. Record you generalization.

11. Now, use the difference quotient calculation method to determine an expression for the difference quotient, $\frac{g(x+h)-g(x)}{h}$ (where g(x) is your quadratic function) and then take the limit as h approaches 0 ⇒ i.e $\lim_{h\to 0}\frac{g(x+h)-g(x)}{h}$. What do you notice?

PART B - Extensions - Cubics and Quartics

12. Now, create an equation of a cubic polynomial. Record the equation on the board. Repeat STEPS 3,5,7 and 8 to come up with the equation of your **derived function** from this cubic function. (Remember to show me the scatter plot as before and remember to record the equation of your **derived function** on the board next to your original cubic function)

13. From our class data, can we make generalizations about the **derived functions** of cubics?

14. Now, create an equation of a quartic polynomial. Record the equation on the board. Repeat STEPS 3,5,7 and 8 to come up with the equation of your **derived function** from this quartic function.

15. From our class data, can we make any generalizations about the **derived functions** of quartic functions?

16. From our class work in Lab 6, can we make any generalizations about the **derived functions** of polynomial functions?