**Next Steps**

When it comes to using this type of lesson to come up with the rules of differentiation, this is a good starting point. The teacher could share the results from Student Assignment 2 with the whole class. When presented with several examples of functions of the form f(x)=ax2, some students might notice a pattern emerging. Over the next few lessons it is important that students have an opportunity to engage with examples of quadratic functions of the form ax2 and that they repeat the exploration of the relationship between these functions and their derivatives. We should not jump straight to generalising, all students need time to discover for themselves that there is a connection between the algebra of the function and its derivative. Over the course of these investigations the teacher can guide their thinking with the use of support questions to move their learning forward.

Sample Support Questions:

*What do you notice about each derivative function?*

*Can you generalise the relationship between the parent function and the derivative?*

*Can you describe each function?*

*Can you write the equation for the new function?*

*Discuss with the person sitting next to you and compare each of the graphs.*

*Can you come up with a general rule for finding the derivatives to the functions?*

Next they could engage with functions of the form x3 and ax3 so that they may come to more coherent generalisations. By using this method they should ultimately be able to understand fully why f(x) = axn and f’(x) = anxn-1.

In the following lessons the teacher would explain to students after several investigations that the tool they are using to measure the rates of change is called differentiation. When we differentiate a function we get the derivative of that function. The derivative of the function is the measure of the rates of change of that function. We can measure this by constructing tangents at different points on the function and using the slopes of these tangents to calculate the derivative. This is how we measure the rate of change of a function using calculus.

It may be useful to plot the derivative functions. Here is an example of how to plot the derivative function using a GeoGebra file:

<https://www.projectmaths.ie/geogebra/rates-of-change-of-quadratic-function-with-trace/>

Teaching calculus in this way creates an opportunity for maths teachers to make differentiation more accessible for their students, instead of just another list of rules. It makes calculus more authentic for the student and is an excellent opportunity for opening up a discussion about the need for calculus in other STEM subjects.