YEAR 11 - MATHEMATICS

Preliminary Topic 18(4) - Calculating with Derivatives

MATHEMATICS ADVANCED

LEARNING PLAN			
Learning Intentions Student is able to:	**Learning Experiences** Implications, considerations and implementations:	**Success Criteria** I can:	**Resources**
Use the formula $\frac{d}{dx}(x^n) = nx^{n-1}$ for all real values of n.	Find the equation of the gradient function using algebraic techniques. Students use dynamic graphing applets to explore the algebraic relationship between the equation of a function of the form $y = ax^n$ and its gradient function. Formalises this rule as $\frac{d}{dx}x^n = nx^{n-1}$.	• Find the gradient function using algebraic techniques	For example, students use the applet called 'Investigating the Gradient Function' which can be found here: https://www.geogebra.org/m/tguvt5AR to choose a function to explore. They use the applet to generate the gradient function

			and then guess the equation of the gradient function by trial and error, recording their findings. The class then compiles the results and uses them to generalise the pattern that emerges.
Differentiate a constant multiple of a function and the sum or difference of two functions.	Students understand and explain why: ▪ the derivative of a constant is zero ▪ the derivative of a linear function is a constant ▪ the derivative of a constant multiple of a function is a constant multiple of the derivative of the function ▪ the derivative of the sum or difference of two functions is the sum or difference of the derivatives of the two functions.	● Differentiate a constant ● Differentiate simple linear functions ● Differentiate term by term ● Differentiate a functions which is a constant multiple of another function	
	Use the derivative to find the gradient of the tangent at a given point and use this information to solve simple problems.	● Find the gradient of the tangent at a point ● Use the gradient of the tangent to solve problems	
Understand and use the : ● Product rule, ● quotient rule and	Practise using these terms to construct new functions using the terminology product, quotient and function of a function.	● Differentiate using the product rule	Students use digital technologies to

• chain rule to differentiate functions of the form $f(x)g(x)$, $\frac{f(x)}{g(x)}$ and $f(g(x))$ where $f(x)$ and $g(x)$ are functions.	Use differentiation by first principles to establish a proof of the chain rule. Practise using the chain rule to find the derivative of composite functions involving power functions.	• Differentiate using the quotient rule • Differentiate using the chain rule	gain an intuitive understanding of the chain rule. A sample activity can be located here: http://webspace.ship.edu/msrenault/GeoGebraCalculus/derivative_intuitive_chain_rule.html
Calculate derivatives of power functions to solve problems, including finding an instantaneous rate of change of a function in both real life and abstract situations.	Practise using the product and quotient rules to find the derivative of functions involving power functions.		
Use the derivative in a variety of contexts, including finding the equation of a tangent or normal to a graph of a power function at a given point.		• Establish the equation of a tangent to a curve • Establish the equation of a normal to a curve	
Determine the velocity of a particle given its displacement from a point as a function of time.	Solve both theoretical and practical problems that require finding the derivatives of a wide variety of power functions, including those that involve acceleration, velocity, displacement and time.	• Determine the velocity of a particle given its	

		displacement as a function of time	
determine the acceleration of a particle given its velocity at a point as a function of time.		• Determine the acceleration of a particle given the velocity of a function at a point of time	