The Sutton Academy

Knowledge Rich Curriculum Plan

Course/Unit

Lesson/Learning Sequence	Intended Knowledge: *Students will know that…*	Tiered Vocabulary	Prior Knowledge: *In order to know this students, need to already know that…*	Assessment
To learn how to differentiate sinx and cosx.	• *Students need to know how to differentiate sinx and cosx from first principles* • *Students will need to know that they will always needs to use radians when differentiating trigonometric functions* • *Students will need to know that if y = sinkx then dy/dx = kcoskx* • *Students will need to know that if y = coskx, then dy/dx = -ksinkx* • *Students will need to know how to find stationary points on the graph of a trigonometric function using differentiation*		Students will need to know how to differentiate from first principles Students will know how to differentiate a term with a constant in front of it. Students will need to know how to differentiate quadratic expressions. Students will need to know how to differentiate function with two or more terms by differentiating one term at a time. Students will need to know how to find stationary points using differentiation Students will need to know how to find the equations of tangents and normal	
To learn how to differentiate exponentials and logarithms.	• Students will know how to differentiate expressions involving exponentials and logarithms • Students will know that if $y = e^{kx}$, then $dy/dx = ke^{kx}$ • Students will know that if y = lnx, then dy/dx = 1/x • Students will know that for any real constant, k, lnkx = lnk + lnx and therefore since lnk is also a constant, the derivative of lnkx is also 1/x • Students will know that you can use the derivative of e^{kx} to find the derivative of a^{kx} where a is any positive real number • Students will know that if $y = a^{kx,}$ where k is a real constant and a>0, then $dy/dx = a^{kx}$ klna		Students will know that for any real constant, k, lnkx = lnk + lnx Students will need to know how to find the equations of tangents and normal	
To learn how to use the chain rule to differentiate composite functions.	• Students will know that the chain rule can be used to differentiate composite functions or functions of another function • Students will know that the chain rule is dy/dx = dy/du x du/dx, where y is a function of u and u is another function of x • Students will know that you can write the chain rule using function notation • Students will know that if y = (f(x))^n then dy/dx = n(f(x))^n-1 f'(x) • Students will know that if y = f(g(x)) then dy/dx = f'(g(x))g'(x) • "Students will know that when functions are not i nthe form y = f(x) then the following particular case of the chain rule is used: • dy/dx = 1/dx/dy"		Students will need to know how to show that a point lies on a curve Students will need to know how to differentiate functions Students will need to know how to differentiate trigonometric functions Students will need to know how to find the gradient of a function using differentiation Students will need to know the trig identities	
To learn how to use the product rule to differentiate the product of two functions.	• Students will know how to differentiate the product of two functions • Students will know that if y = uv then dy/dx = u dv/dx + v du/dx, where u and v are functions of x • Students will know that if f(x) = g(x)h(x) then f'(x) = g(x)h'(x) + h(x)g'(x) • Students will know that a product of two functions is to separate functions that have been multiplied together		Students will need to know how to show that a point lies on a curve Students will need to know how to differentiate functions Students will need to know how to differentiate trigonometric functions Students will need to know how to find the gradient of a function using differentiation Students will need to know the trig identities	
To learn how to use the quotient rule to differentiate the quotient of two functions.	• Students will know that the quotient rule is If $y = \frac{u}{v}$ then $\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$ where u and v are functions of x. • Students will know that the quotient rule in function notation is: $f(x) = \frac{g(x)}{h(x)}$ then $f'(x) = \frac{h(x)g'(x) - g(x)h'(x)}{(h(x))^2}$ • Students will know how to differentiate using the quotient rule for all functions of x.		Students will need to know how to show that a point lies on a curve Students will need to know how to differentiate functions Students will need to know how to differentiate trigonometric functions Students will need to know how to find the gradient of a function using differentiation Students will need to know the trig identities	

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To learn how to differentiate trigonometric functions.	• Students will know that if $y = tankx$ then $\frac{dy}{dx} = ksec^2kx$ • Students will know that if $y = coseckx$ then $\frac{dy}{dx} = -kcosec^2kxcotkx$ • Students will know that if $y = seckx$ then $\frac{dy}{dx} = -ksec^2kxtankx$ • Students will know that if $y = cotkx$ then $\frac{dy}{dx} = -kcosec^2kx$ • Students will know how to use different rules of differentiation to differentiate functions involving tankx, coseckx, seckx and cotkx		Students will need to know how to use the quotient rule Students will need to know how to use the product rule. Students will need to know how to differentiate basic trig identities. Students will need to know how to manipulate trig identities.	
To learn how to differentiate trigonometric functions.	• Students will know that if $y = arcsinx$ then $\frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}}$ • Students will know that if $y = arccosx$ then $\frac{dy}{dx} = -\frac{1}{\sqrt{1-x^2}}$ • Students will know that if $y = arctanx$ then $\frac{dy}{dx} = \frac{1}{1+x^2}$ • Students will know how to use different rules of differentiation to differentiate functions involving arcsin x, arccos x and arc tanx		Students will need to know how to use the quotient rule Students will need to know how to use the product rule. Students will need to know how to differentiate basic trig identities. Students will need to know how to manipulate trig identities.	
To learn how to differentiate parametric functions.	• Students will know that if x and y are given as functions of a parameter, t: $\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$ • Students will know how to differentiate a parametric equation. • Students will know how to find the gradient of a curve defined parametrically. • Students will know how to find the normal of a curve defined parametrically		Students will need to know how to use the quotient rule Students will need to know how to use the product rule. Students will need to know how to trig identities. Students will need to know how to manipulate trig identities.	
To learn how to use implicit differentiation.	• Students will know that that an equation in the form y=f(x) is given explicitly • Students will know that equations which involve functions of both x and y are called implicit equations. • Students will know that from the chain rule $\frac{d}{dx}(f(y)) = f'(y)\frac{dy}{dx}$ • Students will know that the two specific results are useful for implicit differentiation: - $\frac{d}{dx}(y^n) = ny^{n-1}\frac{dy}{dx}$ - $\frac{d}{dx}(xy) = x\frac{dy}{dx} + y$ • Students will know that when you differentiate implicit equations your expression for $\frac{dy}{dx}$ will be given in terms of both y and x • Students will know how to differentiate equations defined as implicit. • Students will know how to solve problems using implicit differentiation.		Students will need to know how to use the quotient rule Students will need to know how to use the product rule. Students will need to know how to trig identities. Students will need to know how to manipulate trig identities.	

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To learn how to use second derivatives to determine if a curve is concave or convex.	• Students will know that the function f(x) is concave on a given interval if and only if $f''(x) \leq 0$ • Students will know that the function f(x) is convex on the interval [a, b] if and only if $f''(x) \geq 0$ for every value of x in that interval. • Students will know how to find the interval on which a function is concave. • Students will know how to show that a function in concave. • Students will know a point of inflection is a point at which a curve changes from being concave to convex (or vice versa) • Students will know that a point of inflection is a which $f''(x)$ changes sign. • Students will know how to find points of inflections.		Students will need to know how to use the quotient rule Students will need to know how to use the product rule. Students will need to know how to trig identities. Students will need to know how to manipulate trig identities.	
To learn how to use the chain rule to connect rates of change in situations involving more than two variables.	• Students know that you can use the chain rule to connect rates of change in situations involving more than two variables. • Students will know that an equation which involves a rate of change is called a differential equation. • Students will know that you can use integration to solve differential equations. • Students will know how to differentiate to solve rates of change.		Students will need to know how to use the quotient rule Students will need to know how to use the product rule. Students will need to know how to trig identities. Students will need to know how to manipulate trig identities.	

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