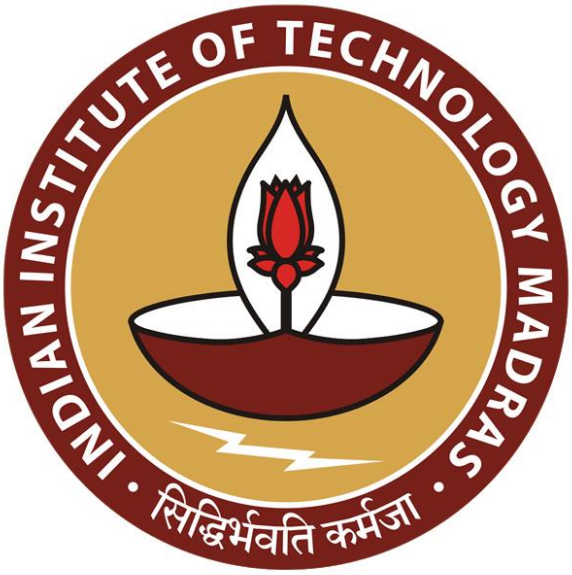

IIT Madras

ONLINE DEGREE

Mathematics for Data Science 2
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Bachelor of Science Online Degree Program
Week 2 Tutorial

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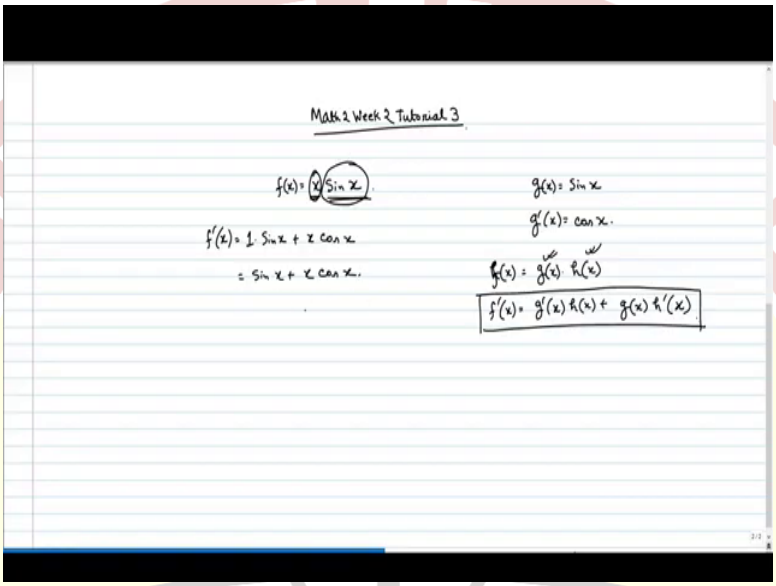

Hello everyone. Welcome to the third tutorial of Math 2 week 2. So, let us consider the function $f(x) = x \sin x$. So, in the last tutorial we have computed the differentiation, the derivative of $\sin x$, so if $g(x) = \sin x$ then we have calculated $\acute{g}(x) = \cos x$, that we have calculated in the second tutorial video.

Now, if there is a function $f(x) = g(x)h(x)$, then its derivative is given by $\acute{f}(x) = \acute{g}(x)h(x) + g(x)\acute{h}(x)$. This is we have learnt in the lecture of week 2. So, here we can see that it is product of two function x and $\sin x$ and we know the derivative of x, we know the derivative of $\sin x$, it is quite easy to calculate $\acute{f}(x) = 1 \sin x + x \cos x = \sin x + x \cos x$.

So, you can see that every time we do not have to apply the definition of derivative and the definition of whether a function is differentiable or not, we need not to apply that thing here. Here we just apply the formula of derivative, the formula of product or derivative of product of function and where both these function $g(x)$ and $h(x)$ are differentiable that we already know because they are x and $\sin x$.

Both are differentiable that we already proved using the formula of, using the definition of derivative or using the definition when the function is differentiable or not. So, in this example if our function is x sin x, its derivative will be $\sin x + x \cos x$. Now, let us try to visualize this in GeoGebra.

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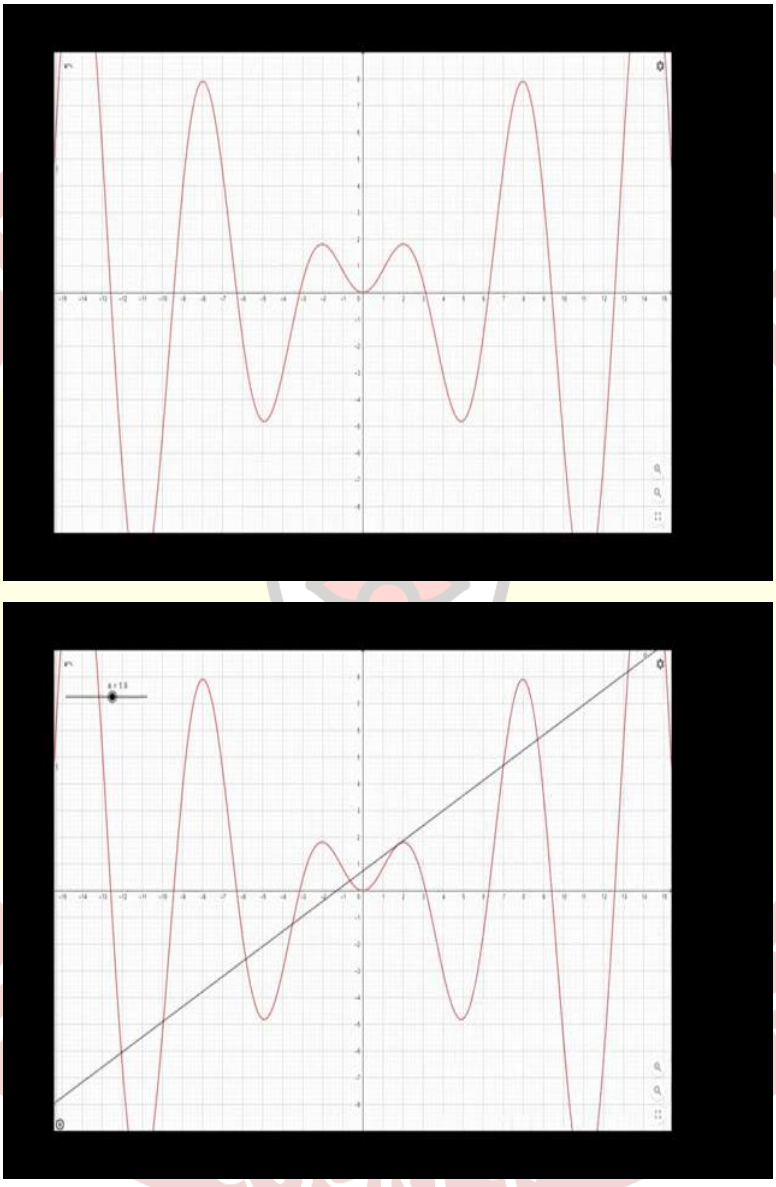

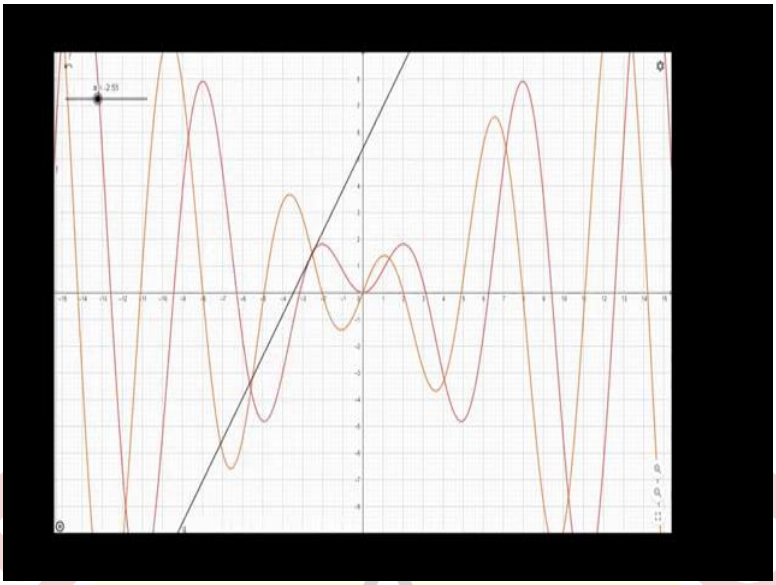

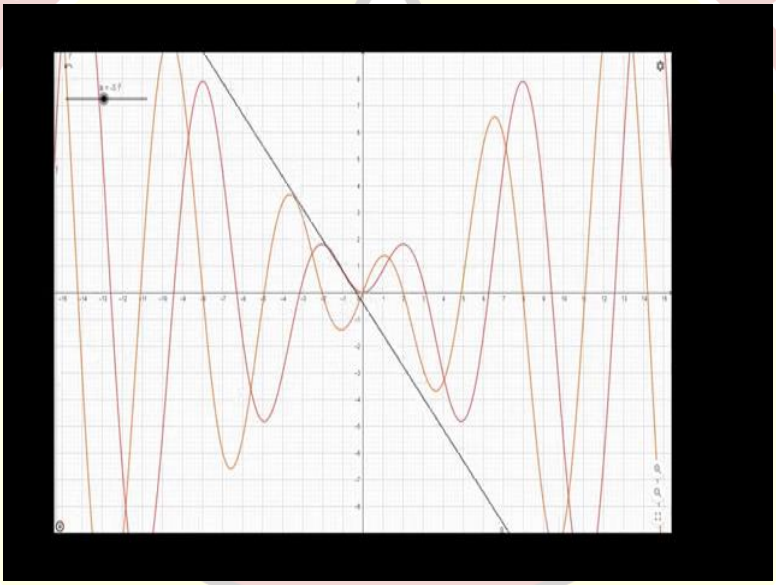

So, $f(x) = x \sin x$, so it looks quite nice in the graph. Now, if we want to see how the tangent behave, so let us see how it behaves. So, you can see that slope of the tangent is also oscillating, the slope of the tangent is oscillating as we move along x axis. So, as we have calculated the derivative of the function will be $\sin x + x \cos x$, so let us visualize from a derivative function only. So, I will remove the $x \sin x$ graph now. So, this is the derivative function $\sin x + x \cos x$. Thank you.