



IIT Madras
ONLINE DEGREE

Mathematics for Data Science 2
Professor Sarang S. Sane
Department of Mathematics
Indian Institute of Technology, Madras
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find the equation of the tangent plane

$$f(x, y) = \sin x \cos y \quad \text{at } \left(\frac{\pi}{3}, \frac{\pi}{2}\right)$$

$$f_x(x, y) = \cos x \cos y \quad f_x\left(\frac{\pi}{3}, \frac{\pi}{2}\right) = 0$$

$$f_y(x, y) = -\sin x \sin y \quad f_y\left(\frac{\pi}{3}, \frac{\pi}{2}\right) = -\sin \frac{\pi}{3} \sin \frac{\pi}{2} = -\frac{\sqrt{3}}{2}$$

$$Z = f\left(\frac{\pi}{3}, \frac{\pi}{2}\right) + 0\left(x - \frac{\pi}{3}\right) + \left(-\frac{\sqrt{3}}{2}\right)\left(y - \frac{\pi}{2}\right)$$

$$\Rightarrow Z = -\frac{\sqrt{3}}{2}\left(y - \frac{\pi}{2}\right) \Rightarrow Z = -\frac{\sqrt{3}}{2}\left(\frac{2y - \pi}{2}\right)$$

$$\Rightarrow 4Z = \pi\sqrt{3} - 2\sqrt{3}y$$

Hello everyone, so in this video we will try to find the equation of the tangent plane represented by the surface of this function $f(x, y) = \sin x \cos y$ at the point $\left(\frac{\pi}{3}, \frac{\pi}{2}\right)$. So, at first what we have to do? We have to calculate what is f_x, f_y . So, which, when we are finding the derivative with respect to x , this will give us $\cos x \cos y$. And for f_y , we will get $-\sin x \sin y$.

So, $f_x\left(\frac{\pi}{3}, \frac{\pi}{2}\right) = 0$, as $\cos \frac{\pi}{2}$ is 0. And $f_y\left(\frac{\pi}{3}, \frac{\pi}{2}\right) = -\sin \frac{\pi}{3} \sin \frac{\pi}{2} = -\frac{\sqrt{3}}{2}$. Then we will write, we will substitute all these values in the equation of the tangent plane.

So, equation of the tangent plane was $f\left(\frac{\pi}{3}, \frac{\pi}{2}\right) + f_x\left(\frac{\pi}{3}, \frac{\pi}{2}\right)\left(x - \frac{\pi}{3}\right) + f_y\left(\frac{\pi}{3}, \frac{\pi}{2}\right)\left(y - \frac{\pi}{2}\right)$. So, this will be the equation of the tangent plane.

So, the first two terms are 0. So, if we try to simplify this thing, $4Z = \pi\sqrt{3} - 2\sqrt{3}y$. So, this is the function which we are finding. So, this is the equation of the tangent plane. Thank you.