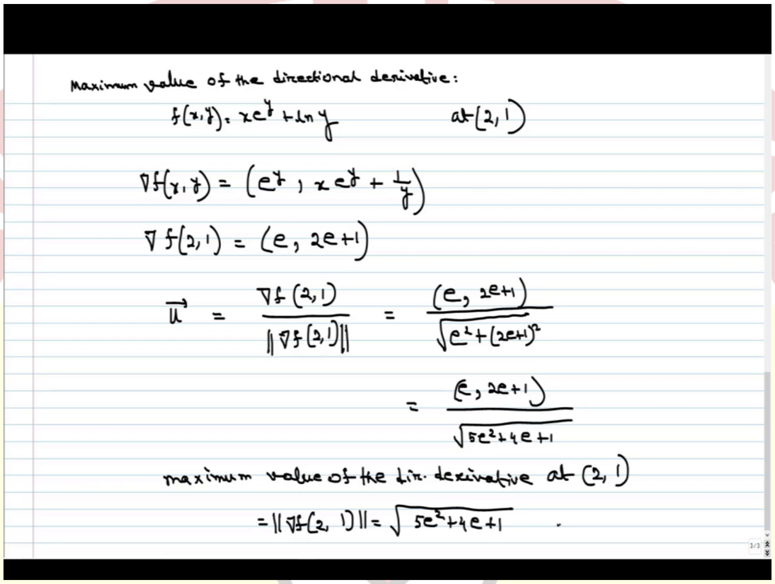
Mathematics for Data Sciences 2
Professor. Sarang S. Sane
Department of Mathematics
Indian Institute of Technology, Madras
Week 11 - Tutorial 02

(Refer Slide Time: 0:14)



Hello everyone, so in this video we will consider another function which is given as $f(x,y) = xe^{y} + \ln y$ And we have to find the, calculate the maximum value of the directional derivative at (2, 1). So, again what we have to do, you know that we have to find the gradient function first gradient vector first.

So, the gradient is $\nabla f(x,y) = (e^{y}, xe^{y} + \frac{1}{y})$ so this is (f_x, f_y) So, for the first coordinate I have find the partial derivative with respect to x and for the second coordinate I have found the partial derivative with respect to y. So, what is $\nabla f(2,1)$ we will just put the value of 2 and 1 here. So, I get $(e, 2e+1)$ so this is the gradient vector at the point (2, 1) of this function.

So, the unit vector along which the directional derivative will be the maximum will be $\frac{\nabla f(2,1)}{\|\nabla f(2,1)\|}$ So, if we calculate this, you will get $(e, 2e+1)$ this is the vector with the term and at the denominator we have to write the norm of, so it is $\sqrt{e^{2} + (2e+1)^{2}}$

So, what we get here, it is $(e, 2e+1)$ and in the denominator we have root over of $\sqrt{5e^2+4e+1}$ So, along this vector the directional derivative will be maxima and the maximum value, the maximum value of the directional derivative at (2, 1), this is nothing but $\|\nabla f(2,1)\|$ So, we have already calculated it, it is $\sqrt{e^2+(2e+1)^2}$ Thank you.