

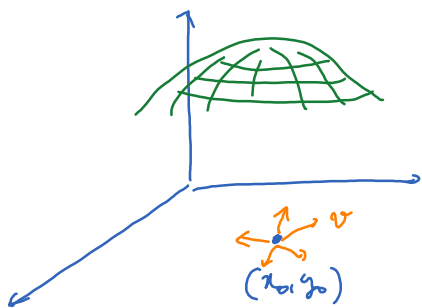
Lecture 10

Wednesday, May 18, 2022 1:02 AM

* Prayer

* Spiritual thought

Directional derivative:



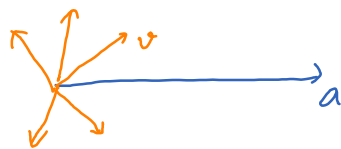
$$D_v f(x_0, y_0) = \nabla f(x_0, y_0) \cdot v$$

Given function f and point (x_0, y_0) , find direction v along which f has the largest rate of change.

$$a = \nabla f(x_0, y_0)$$

$$D_v f(x_0, y_0) = a \cdot v \rightarrow \text{max}$$

This happens when v has the same



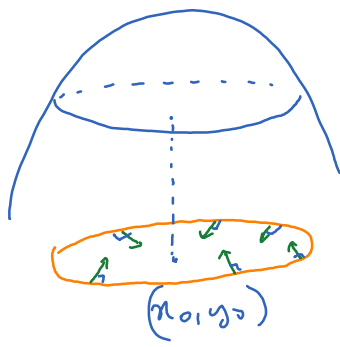
direction as a : $v = \frac{a}{|a|}$

f increases the most in the direction $\frac{\nabla f}{|\nabla f|}$.

Ex: $f(x, y) = x^2 + xy$, $(x_0, y_0) = (1, 2)$

$$\nabla f = (2x + y, x)$$

$$\nabla f(1, 2) = (4, 1)$$



Along the direction perpendicular to a ,
 f doesn't change value.

Observation:

Gradient vector is always perpendicular to the level set.