

Lecture 13

Tuesday, February 9, 2021 4:10 PM

* Prayer

* Spiritual thoughts

* Answering questions

Partial derivatives

$f(x) \rightsquigarrow f'(x)$: rate of change of f with respect to x .

$f(x,y) \rightsquigarrow f_x, f_y$: rate of change of f with respect to x, y , respectively.

Ex : $f(x,y) = x^2 + xy + y^2$ [or $f(x,y) = x^2 + xy - y^3$]

Point $A(1,2)$.

$$\begin{aligned} f_x(1,2) &= \left[f(x,2) \right]' \Big|_{x=1} = (x^2 + 2x + 4)' \Big|_{x=1} \\ &= (2x + 2) \Big|_{x=1} = 4. \end{aligned}$$

To visualize:

$$\text{ContourPlot3D} \left[\left\{ z == x^2 + xy + y^2, y == 2 \right\}, \{x, 0, 2\}, \{y, 1, 3\}, \{z, 1, 20\} \right]$$

Ex (Clairaut's theorem)

Compute u_{xy} and u_{yx} of

$$u = x^3y^2 - y^3$$

$$u = \ln(x+2y)$$

$$u = x^y$$

Question why is $u_{xxyy} = u_{yyxx}$?