partial derivatives

A partial derivative is the derivative of a multivariable function with respect to one variable while treating all other variables as constants.

example

Assume following function:
$$f(x, y) = x^2y + 3xy^3$$

Partial Derivative with Respect to x:
$$\frac{\partial f}{\partial x} = \frac{\partial}{\partial x}(x^2y + 3xy^3) \implies \frac{\partial f}{\partial x} = 2xy + 3y^3$$

Partial Derivative with Respect to y:
$$\frac{\partial f}{\partial y} = \frac{\partial}{\partial y}(x^2y + 3xy^3) \implies \frac{\partial f}{\partial y} = x^2 + 9xy^2$$

the symmetry of second partial derivatives

example

$$f(x, y) = x^2 y + 3xy^3$$

$$\frac{\partial f}{\partial x} = 2xy + 3y^3$$

$$\frac{\partial f}{\partial y} = x^2 + 9xy^2$$