

If $f(x, y)$ is a function, where f partially depends on x and y and if we differentiate f with respect to x and y then the derivatives are called the partial derivative of f . The formula for partial derivative of f with respect to x taking y as a constant is given by:

$$f_x = \frac{\partial f}{\partial x} = \lim_{h \rightarrow 0} \frac{f(x+h, y) - f(x, y)}{h}$$

And partial derivative of function f with respect y keeping x constant, we get;

$$f_y = \frac{\partial f}{\partial y} = \lim_{h \rightarrow 0} \frac{f(x, y+h) - f(x, y)}{h}$$

Consider the following function: $f(x, y) = x^2y$. Partial derivatives of this function are:

$$\begin{aligned} f_x &= \frac{\partial f}{\partial x} \\ &= \frac{\partial}{\partial x}(x^2y) \\ &= 2xy \end{aligned}$$

$$\begin{aligned} f_{xy} &= \frac{\partial f}{\partial y} \\ &= \frac{\partial}{\partial x}(x^2y) \\ &= x^2 \end{aligned}$$