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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 derivatives of f . The formula for the 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 the partial derivative of f with respect y keeping x as constant, we get;

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

The *Gradient* of f at point (x_0, y_0) is defined as follows:

$$\begin{aligned} \nabla f(x_0, y_0) &= \begin{bmatrix} \frac{\partial f}{\partial x}(x_0, y_0) \\ \frac{\partial f}{\partial y}(x_0, y_0) \end{bmatrix} \\ &= \begin{bmatrix} f_x \\ f_y \end{bmatrix} \end{aligned}$$