# Formulas-2

$\lim\limits_{(x,y)\to(x_0,y_0)} f(x,y) = L$ if for every ε>0, there exists a corresponding δ>0, such that for all $(x,y)$ in the domain of f, $|f(x,y) - L| < \epsilon$ whenever $0 < \sqrt{(x-x_0)^2 + (y-y_0)^2} < \delta$

$$\frac{\partial f}{\partial x}|_{(x_0,y_0)} = \lim_{h\to 0} \frac{f(x_0+h,y_0) - f(x_0,y_0)}{h} = f_x(x_0,y_0)$$

$$f_{xx} = \frac{\partial^2 f}{\partial x^2} = \frac{\partial}{\partial x}\left(\frac{\partial f}{\partial x}\right)$$

$$f_{yy} = \frac{\partial^2 f}{\partial y^2} = \frac{\partial}{\partial y}\left(\frac{\partial f}{\partial y}\right)$$

$$f_{xy} = \frac{\partial^2 f}{\partial yx} = \frac{\partial}{\partial y}\left(\frac{\partial f}{\partial x}\right)$$

$$f_{yx} = \frac{\partial^2 f}{\partial xy} = \frac{\partial}{\partial x}\left(\frac{\partial f}{\partial y}\right)$$

$$\frac{dw}{dt} = \frac{\partial w}{\partial x}\cdot\frac{dx}{dt} + \frac{\partial w}{\partial y}\cdot\frac{dy}{dt} + \frac{\partial w}{\partial z}\cdot\frac{dz}{dt}$$

$$\frac{dy}{dx} = -\frac{F_x}{F_y}$$

$$f'_u(x,y) = D_u f(x,y) = \lim_{s\to 0}\frac{f(x+su_1, y+su_2) - f(x,y)}{s} = \nabla\ \mathrm{f}(x,y)\cdot u$$

$$\nabla\ f(x,y,z) = \frac{\partial f}{\partial x}i + \frac{\partial f}{\partial y}j + \frac{\partial f}{\partial z}k$$

Tangent line to a level curve: $f_x(x-x_0) + f_y(y-y_0) = 0$

$$\frac{d}{dt}(f(r(t)) = \nabla\ \mathrm{f}(r(t)) \bullet\ r'(t)$$