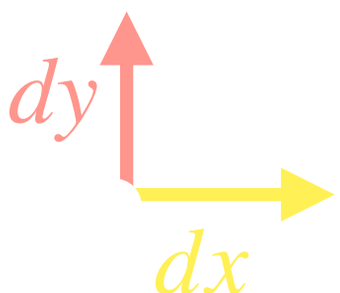
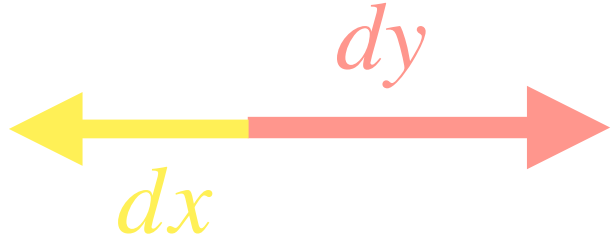
partial derivatives

for $f(x, y, z, \ldots)$

$$\frac{\partial f}{\partial y}(1,2)$$



$$\frac{\partial f}{\partial x}(1,2)$$


dy
dx

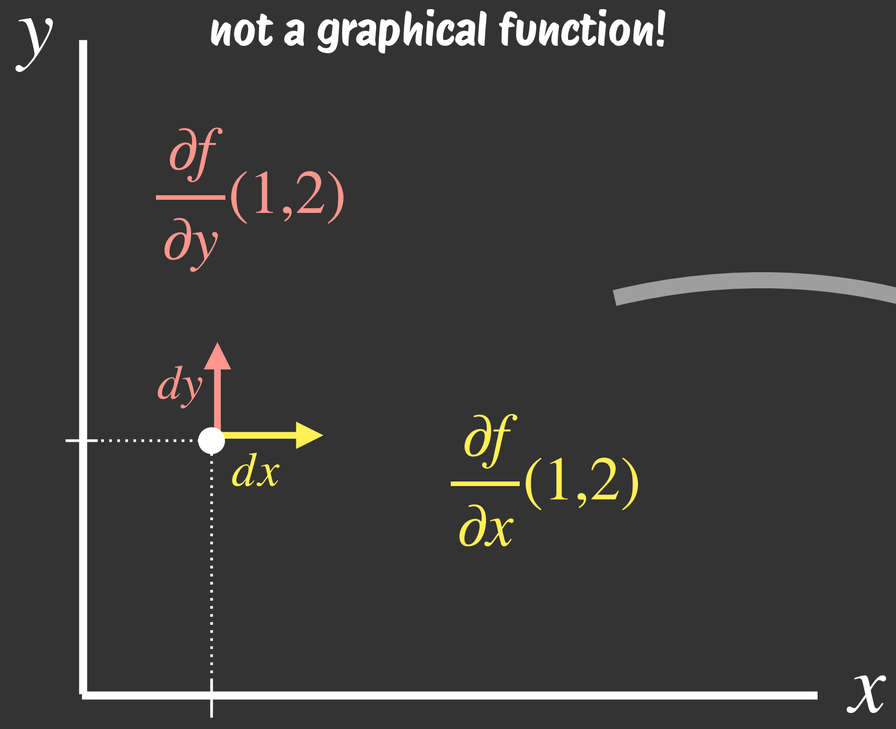
partial derivatives

Now: assume $f(x, y)$ with $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$

$$\frac{\partial f}{\partial x} = \lim_{h \to \infty} \frac{f(a+h, b) - f(a, b)}{h}$$

$$\frac{\partial f}{\partial y} = \lim_{h \to \infty} \frac{f(a, b+h) - f(a, b)}{h}$$

⋮ for $f(x, y, z, \ldots)$



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