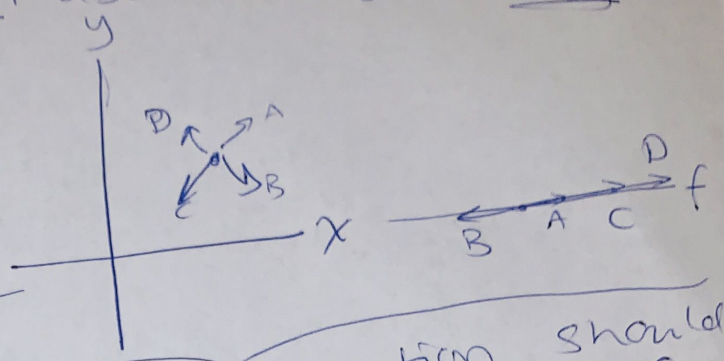
GRADIENT

"Path of steepest ascent"... but why?

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

$\nabla f = \begin{bmatrix} \partial f/\partial x \\ \partial f/\partial y \end{bmatrix}$

bundle all the partial derivatives together in one vector!



which direction should I go to increase the function most? The gradient tells you

$f(x,y) = x^2 \sin(y)$

$\nabla f(x,y) = \begin{bmatrix} \frac{\partial f}{\partial x} \\ \frac{\partial f}{\partial y} \end{bmatrix} = \begin{bmatrix} 2x\sin(y) \\ \cos(y)x^2 \end{bmatrix}$

$\nabla f = f_x \hat{i} + f_y \hat{j}$

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