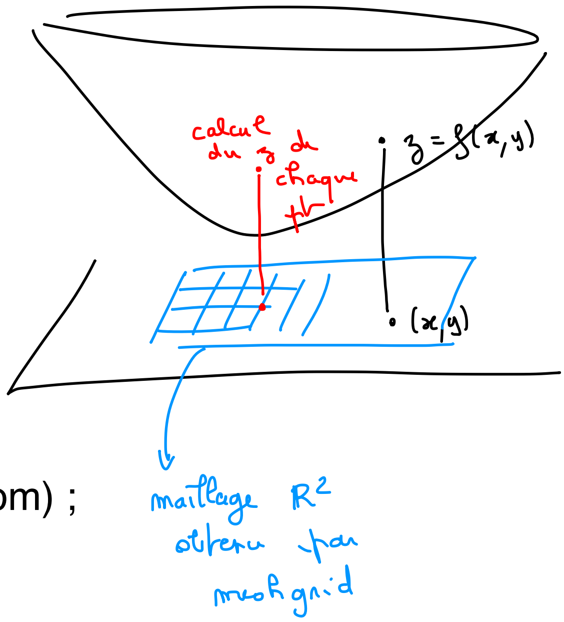
TP 4

Représentation $f(x,y)$ en élévation




```
alpha = 1 ;
beta = 2 ;
f = @(x,y) alpha*x.^2 + beta*y.^2 ;
zoom =  2 ;
[X,Y] = meshgrid(-zoom:0.1:zoom, -zoom:0.1:zoom) ;
Z = f(X,Y) ;
mesh(X,Y,Z);
```

$f_1(x,y) = \alpha x^2 + \beta y^2$ → quad

→ ${}^tX . \Omega . X$ $\qquad \Omega = \begin{pmatrix} \alpha & 0 \\ 0 & \beta \end{pmatrix}$

$$\nabla f_1(X) = 2\,\Omega X = 2 \begin{pmatrix} \alpha & 0 \\ 0 & \beta \end{pmatrix} X \qquad X = \begin{pmatrix} x \\ y \end{pmatrix}$$

$$\nabla f_1(x,y) = \begin{pmatrix} 2\alpha x \\ 2\beta y \end{pmatrix}$$

⚠

Maths | **Codage**

$f_1 : \mathbb{R}^2 \longrightarrow \mathbb{R}$

$(x,y) \longmapsto \alpha x^2 + \beta y^2$

→ $f_1(x,y)$ ← rendu

?

→ $f_1(X)$ ← descente grad

Quand rendu + descente

rendu

$$\left[\begin{array}{l} \text{graph\_}f_1 = @(x,y)\ \alpha * x.\hat{}2 + \beta * y.\hat{}2 ; \\ f_1 = @(X)\ \text{graph\_}f_1(X(1), X(2)) ; \end{array}\right.$$

$$f(\underbrace{X_0 + d.\vec{d_0}}_{\text{c.l.}})$$

descente_pas_fixe $(f, \nabla f, x_0 \; \dots)$

$\vdots$

tant que ($\times$

$\frac{\|x_{i+1} - x_i\|}{\|x_i\|}$ / $\|x_{i+1} - x_i\|$

$f(x_{i+1}) - f(x_i)$ / $\|\nabla f(x_i)\|$

$\quad x \leftarrow x \boxed{- \underbrace{\text{step\_size} \times \underbrace{\nabla f(x)}_{\to 0}}_{x_{i+1} - x_i}}$

ftq $\underline{\text{diff}}$

$\min f \longleftrightarrow \nabla f = 0$

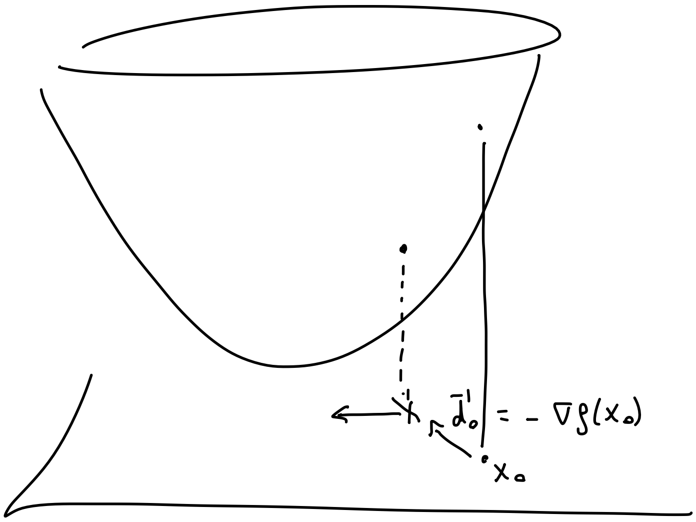
$\frac{\|x_{i+1} - x_i\|}{\|x_{i+1}\|} \leq \dots$

tant que (norm(diff) / norm(x) $> \varepsilon$)

$\quad$ diff $\leftarrow$ step_size $\times \nabla f(x)$

$\quad x \leftarrow x -$ diff

ftq



$$f_2(x,y) = (\alpha x^2 + \beta y^2) \cdot (2 + \sin(x^2 + y^2))$$

$$= {}^tX . \Omega . X . (2 + \sin({}^tX . X))$$

$$\Omega = \begin{pmatrix} \alpha & 0 \\ 0 & \beta \end{pmatrix}$$

$$\boxed{\nabla f_2(X) = 2 \Omega X \cdot (2 + \sin(\|X\|^2)) + {}^tX . \Omega . X \, (2X . \cos(\|X\|^2))}$$