

Soit  $f(x,y) = x^2y + 3xy^2$

### 1. Gradient

$$\nabla f(x,y) = \begin{bmatrix} 2xy + 3y^2 \\ x^2 + 6xy \end{bmatrix}$$

### 2. Dérivées partielles secondes

$$\frac{\partial^2 f}{\partial x^2} = 2y$$

$$\frac{\partial^2 f}{\partial y^2} = 6x$$

$$\frac{\partial^2 f}{\partial x \partial y} = 2x + 6y$$

$$\frac{\partial^2 f}{\partial y \partial x} = 2x + 6y$$

### 4. Différentielle

$$df = (2xy + 3y^2)dx + (x^2 + 6xy)dy$$

Soit  $f(x,y) = x^3 + 2xy + y^4$

### 1. Gradient

$$\nabla f(x,y) = \begin{bmatrix} 3x^2 + 2y \\ 2x + 4y^3 \end{bmatrix}$$

### 2. Dérivées partielles secondes

$$\frac{\partial^2 f}{\partial x^2} = 6x$$

$$\frac{\partial^2 f}{\partial y^2} = 12y^2$$

$$\frac{\partial^2 f}{\partial x \partial y} = 2$$

$$\frac{\partial^2 f}{\partial y \partial x} = 2$$

### 4. Différentielle

$$df = (3x^2 + 2y)dx + (2x + 4y^3)dy$$