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

$$\frac{\partial f(x,y)}{\partial x} = 2(x-y) + 3(x+y)^2 = 0$$

$$\frac{\partial f(x,y)}{\partial y} = 2(y-x) + 3(x+y)^2 = 0$$

Donc $2(x-y) = 2(y-x) \Leftrightarrow y - x = 0 \Leftrightarrow y = x$

$\Leftrightarrow \quad x = 0$ et $y = 0$.

Donc le point $A(0;0)$ est un point critique. Est-ce un extremum ?

$$\frac{\partial^2 f(0,0)}{\partial x^2} = (2 + 6(x+y))(0,0) = 2$$

$$\frac{\partial^2 f(0,0)}{\partial y^2} = 2$$

$$\frac{\partial^2 f(0,0)}{\partial x \partial y} = -2$$

La forme quadratique est $2x^2 - 4xy + 2y^2 = 2(x^2 - 2xy + y^2)$

$= 2(x-y)^2 > 0$ quand $x \to 0$ et $y \to 0$

$\boxed{\text{Donc } A(0,0) \text{ est un minimum local.}}$