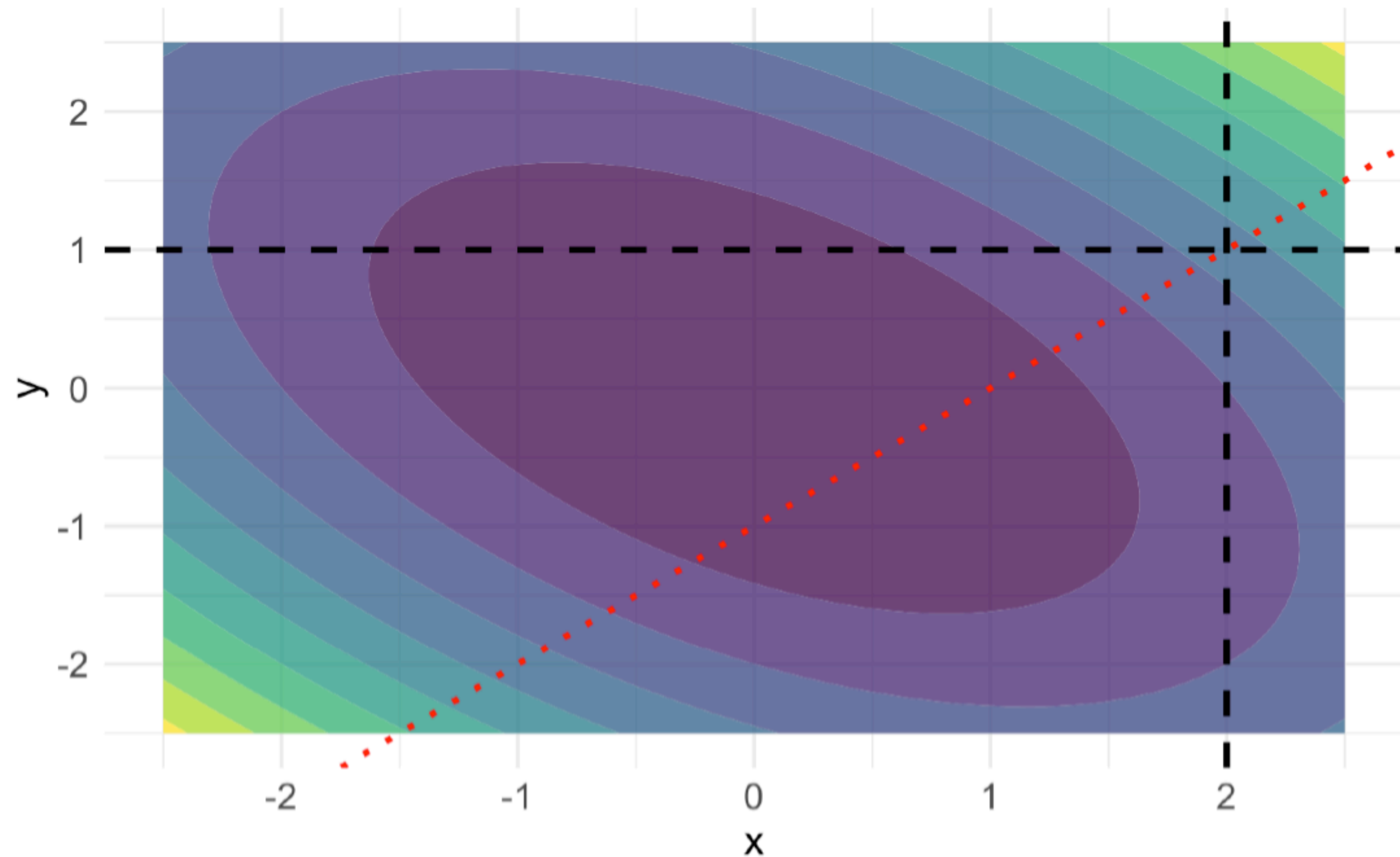# Gradient Descent

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

Partial Derivatives:

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

$$\begin{bmatrix} \dfrac{\partial f}{\partial x} \\ \dfrac{\partial f}{\partial x} \end{bmatrix} = \begin{bmatrix} 2x + 1 \\ x + 2y \end{bmatrix}$$

Gradient Descent

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

Step size determined by

Learning Rate ρ:

$$\begin{bmatrix} x_{new} \\ y_{new} \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix} - \rho \begin{bmatrix} \dfrac{\partial f}{\partial x} \\ \dfrac{\partial f}{\partial y} \end{bmatrix}$$