

Hessian

The Hessian provides a way to classify critical points (where the gradient is zero).

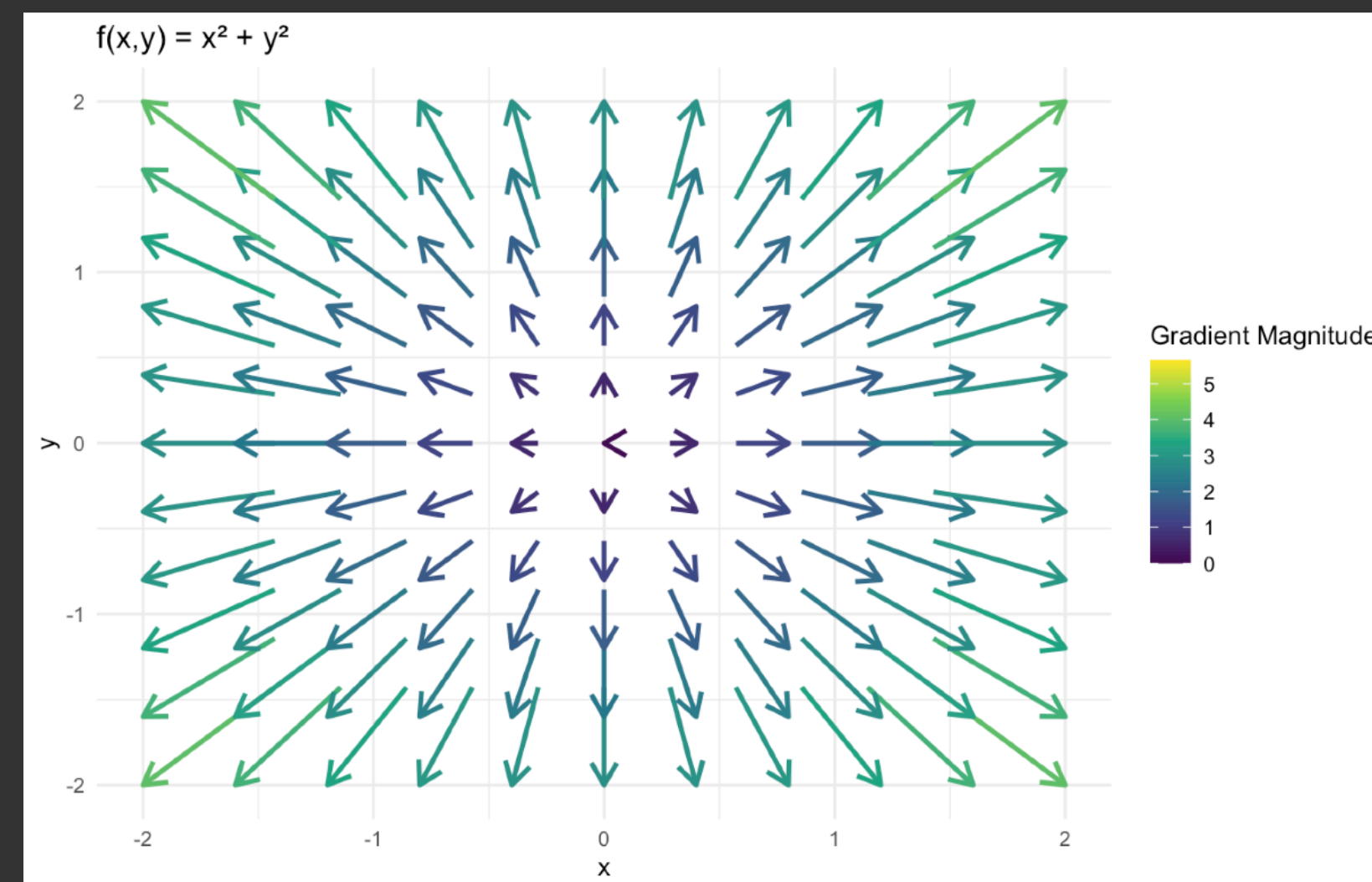
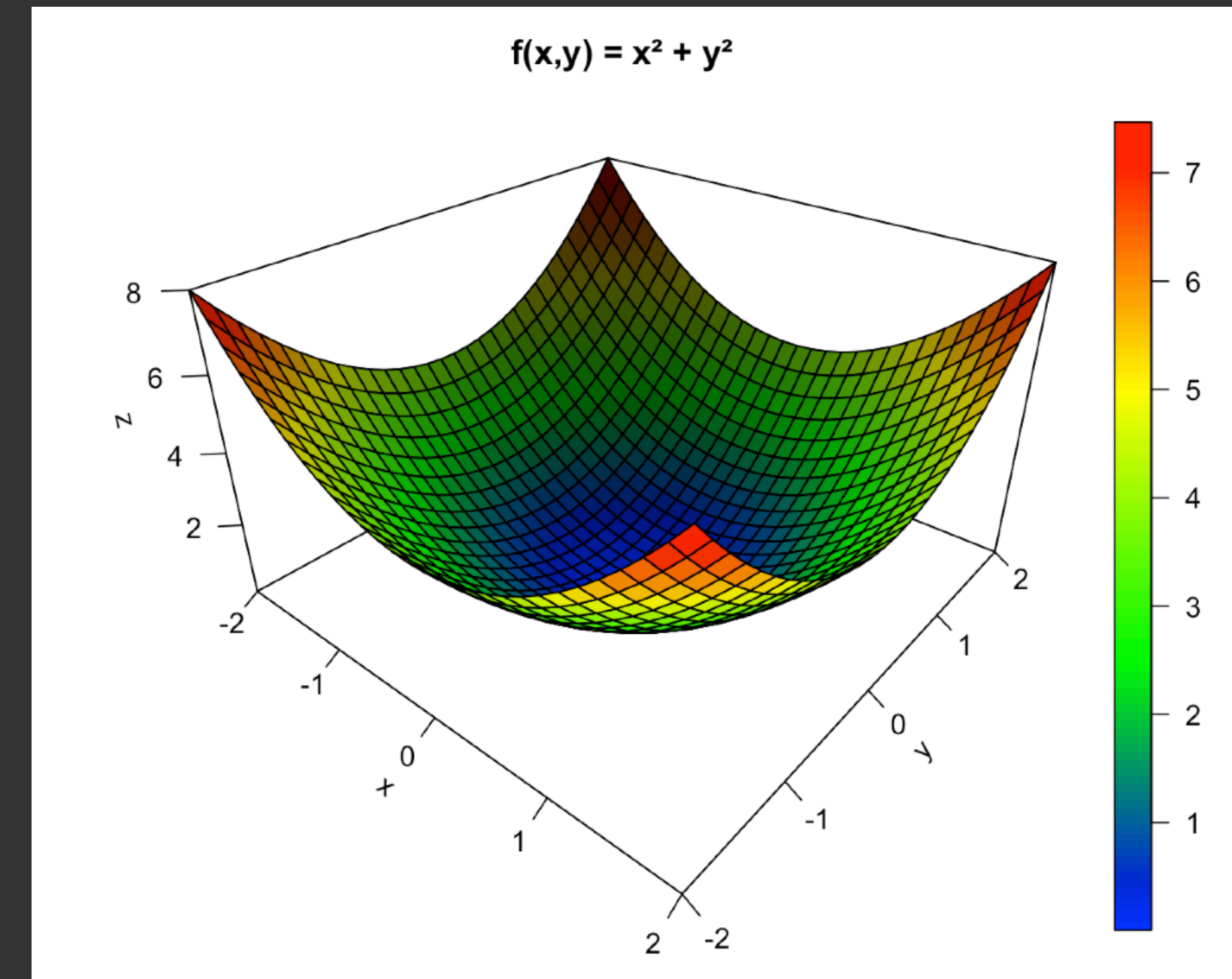
example

For $f(x, y) = x^2 + y^2$, the Hessian is:

$$H = \begin{bmatrix} \frac{\partial^2 f}{\partial x^2} & \frac{\partial^2 f}{\partial x \partial y} \\ \frac{\partial^2 f}{\partial y \partial x} & \frac{\partial^2 f}{\partial y^2} \end{bmatrix} = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$$

Diagonal matrix with positive values indicating function is convex

Eigenvalues?



chain rule: multivariable functions

If $f(x(t), y(t))$, and both x and y are functions of a single variable t , then:

$$\frac{df(x(t), y(t))}{dt} = \frac{\partial f}{\partial x} \frac{dx}{dt} + \frac{\partial f}{\partial y} \frac{dy}{dt}$$