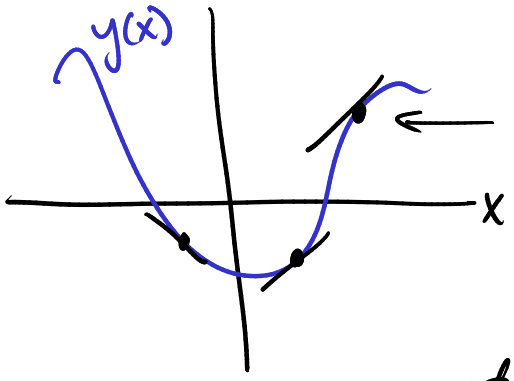
Slope fields and solution curves
(Geometric approach to DEs)

Lets consider a first-order Differential equation

$$\frac{dy}{dx} = f(x,y) \quad \text{eg.} \quad \frac{dy}{dx} = y^2, \quad \frac{dy}{dx} = xy$$

Can't directly integrate because right hand side depends on y, the unknown function.

What does the equation mean geometrically



$\leftarrow$ slope $= f(x, y(x))$

That is, the solution curve $y(x)$ (whatever it may be) must have at each point a slope $f(x,y(x))$ depending on x and the value of the solution $y(x)$, that is, depending on where we are in the xy-plane

Idea: Plot all the possible slopes $\Longrightarrow$ get **Slope field**

$f(x,y) = xy$