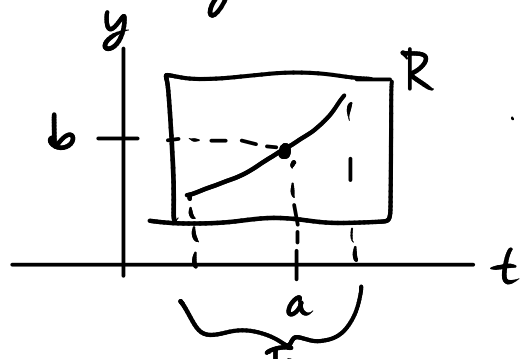
More formally Theorem of Existence and Uniqueness



Initial value problem

$$\begin{cases} \frac{dy}{dt} = f(t,y) \\ y(a) = b \end{cases}$$

Suppose $f(t,y)$ and $\frac{\partial f}{\partial y}(t,y)$ are continuous on a rectangle containing (a,b).

Then there is an interval I containing a such that the initial value problem has exactly one solution on I.

Note that this theorem doesn't say anything about long-time existence. (Example 2.)