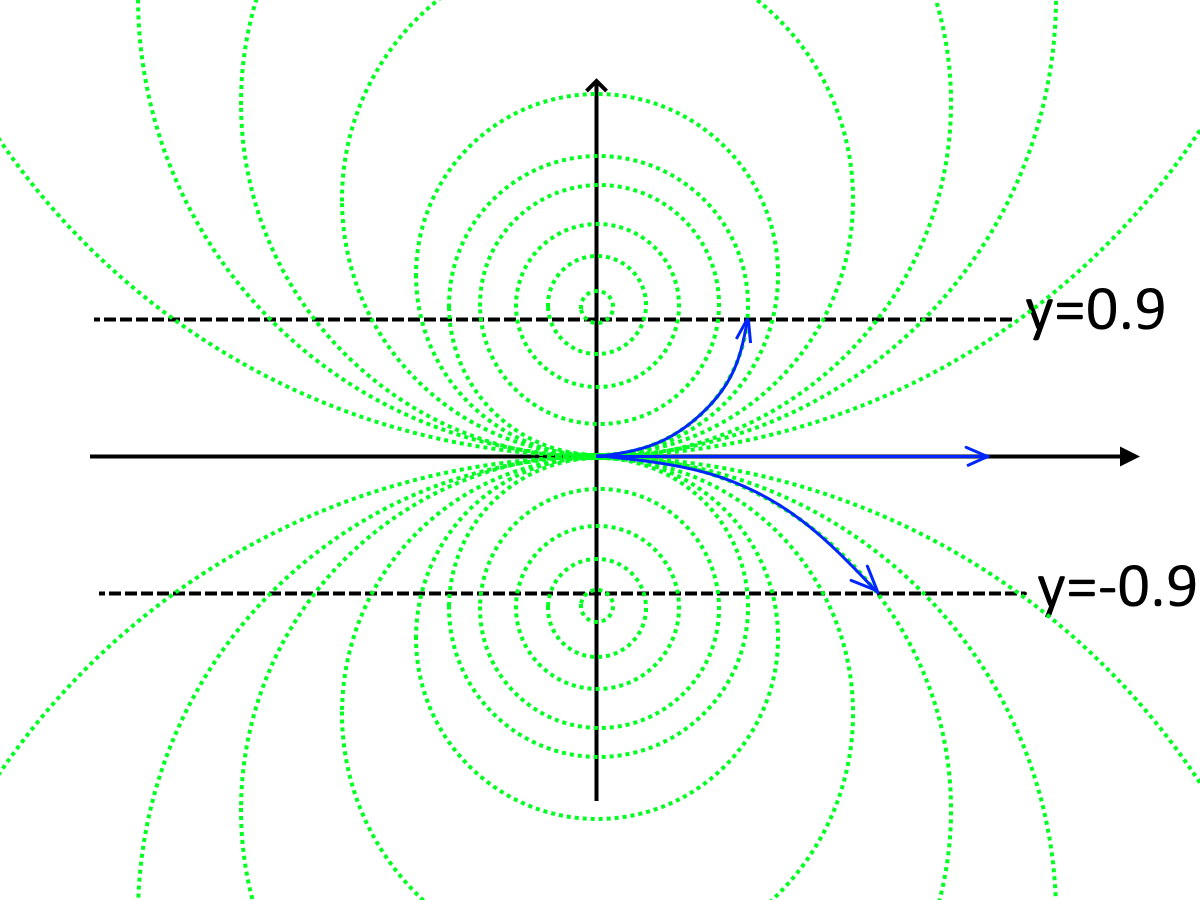
A "counter example" to Picard–Lindelöf theorem

Of course, the title is a click bait. Picard Theorem is proved and the point here is to help me understand it.

Here is the “counter example”:

The first case and the second case describe some concentric circles with center and . The last case describes all circles tangent to the x axis at whose radius is larger than .

The domain is Consider the initial value problem of . This problem apparently has a family of infinite solutions:



The setup is continuous and differentiable everywhere within the domain. Yet the IVP has non-unique solutions. Why?

(Usually when I read a proof with a counter example in mind I can see where I’m wrong, but for this I need help…)