

Behavior of Non-Linear Systems

Non-Linear systems and equations can have behavior that is not possible for their linear counterparts.

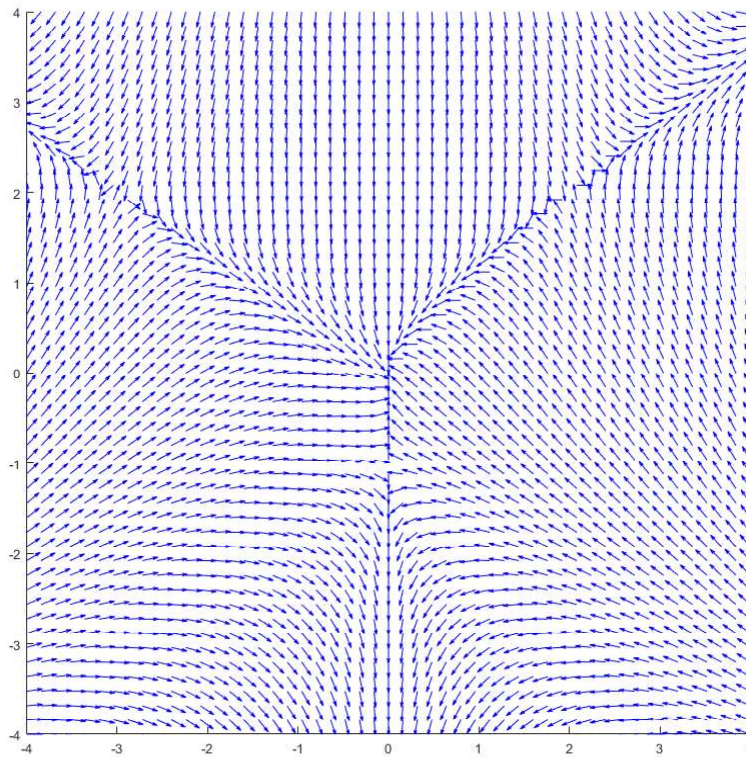
Why can this happen?

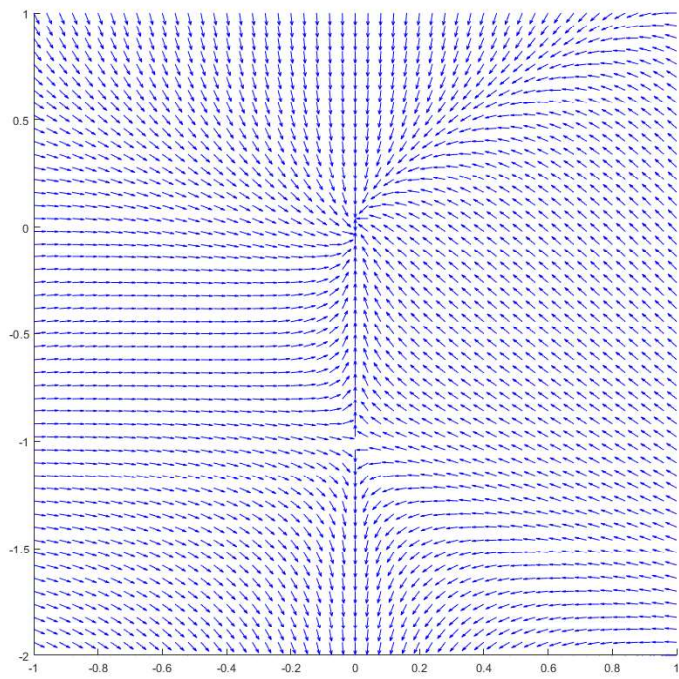
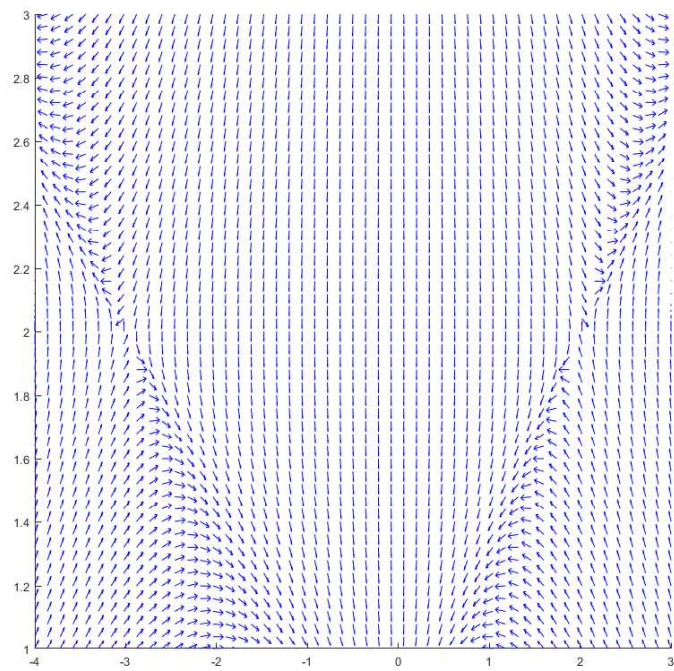
Non-linearity makes things a lot more complicated.

Example. Consider the slope field drawn below for the system

$$\begin{aligned}\frac{dx}{dt} &= x(y - 2) \\ \frac{dy}{dt} &= (x - y)(x + y + 1)\end{aligned}$$

What happens to solutions with a variety of initial conditions?





Terminology

How do we talk about these concepts?