

Goal and idea - Module 3

GOAL:

Introduce initial value problems and develop some criteria to help determine the existence and uniqueness of solutions for such problems.

To do so, we:

- Define what an initial value problem is, including initial conditions.
- Develop a way to find whether (certain) initial value problems have a unique solution.
- Briefly discuss what a boundary value problem is.

IDEA:

As we have previously seen, it is common that a DE has infinite many solutions. However, in graphing the solutions we see that while they all look similar they are each shifted. In particular, given a specific point in the graph, it appears that there is only one solution which would pass through this point. This is the geometric motivation of initial value problems. In other words, an initial value problem asks whether there is a solution for a DE which given an input, has a desired output. We would like to study such problems, and in particular, develop some criteria to help determine the existence and uniqueness of such solutions.

Time: Videos run 42:36 minutes.