

EECS203002 Ordinary Differential Equations

Bonus Project: Solution Mixing

Deadline: 08:00, December 9, 2024

I. Introduction

In this project, you are asked to write a program to sketch solute concentration dynamics curves for the following problem and demonstrate your program to show how it works.

II. Problem Description

A container has Q_0 g of sugar dissolved in 100 liters of water. Assume the water containing X g of sugar per liter is flow into the container at a rate of R liters per minute and the well-stirred sugar water is draining from the container at the same rate. Note that Q_0 , X and R are user-defined parameters.

III. Goals

- A. Write a program to show how different inflow/outflow rates (R) influence the quantity of sugar over time, with fixed initial sugar quantity Q_0 and inflow concentration. Also, mark the values of R on the Cartesian coordinate plane. **(Adding 1 point to your final grade of ODE)**
- B. Write a program to show the impact of different initial sugar amounts (Q_0) on the dynamics, keeping the inflow concentration and rate constant. Also, mark the values of Q_0 on the Cartesian coordinate plane. **(Adding 1 point to your final grade of ODE)**
- C. Write a program to illustrate how varying inflow concentration (X) affects the sugar dynamics, with fixed initial sugar and inflow rate. Also, mark the values of X on the Cartesian coordinate plane. **(Adding 1 point to your final grade of ODE)**

IV. Language

C/C++, Python, MATLAB, or others.

V. Requirements/Grading

- A. Upload the source code of your program to the eeclass platform.
- B. Demonstrate your project by downloading the source code from the eeclass platform and then compile the file in your environment (**using your machine**) and explain the results. The time slots for demonstration will be determined and announced on the eeclass platform later.
- C. The correctness of your results.
- D. **Plagiarism is not allowed. If you are caught, you will FAIL this ODE course, not just getting 0 point in the bonus project.**

Example

The following figure is an example result of this project, Goal A, when we fix X and R , but vary Q_0 .

