

HOMEWORK 8

- Section 9.1 in the book: Exercises 16, 22, 24, 26.
- Section 9.2 in the book: Exercises 2, 6, 8, 12, 16, 20, 22, 26.

Problem 1. Initially, tank A contains 50 gallons of water in which 25 pounds of salt are dissolved, while a second tank B contains 50 gallons of pure water. Pure water is pumped into tank A at the rate of 3 gallons per minute. There are two pipes connecting tank A and tank B. The first pumps salt solution from tank A into tank B at the rate of 4 gallons per minute, while the second pumps salt solution from tank B into tank A at the rate of 1 gallon per minute. Finally, tank B is drained at the rate of 3 gallons per minute. We assume perfect mixing for both tanks.

- (a) Write down the two-dimensional system that models the salt content in each tank over time.
- (b) Find the eigenvalues and eigenvectors of the coefficient matrix in part (a). Use this to write down the general solution to the two-dimensional system in part (a).
- (c) Find the particular solution that satisfies the initial conditions given in the problem.