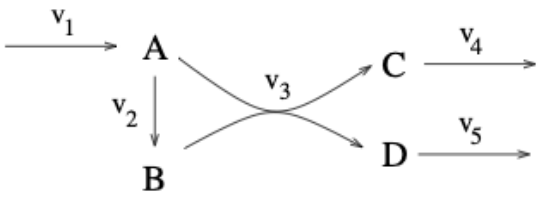
Systems Biology, Computer Lab # 1: Chemical Reaction Models

The goal of this lab is for you to practice building dynamics models and simulating them numerically. For this problem you will consider the following open reaction network:

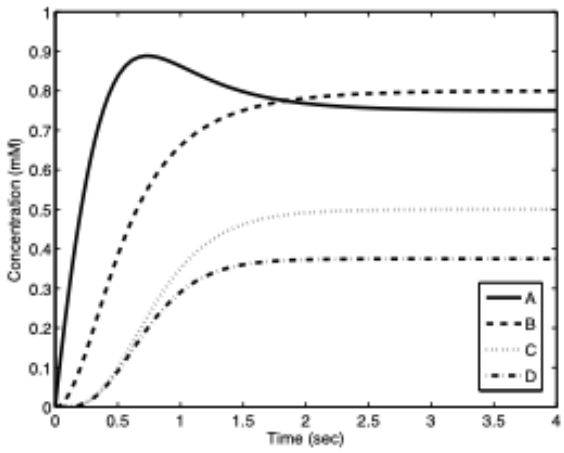


1. In the figure above, the lowercase v's represent the 5 reaction rates in the system. Use the law of mass action to write down the 5 reaction rates using v_i to represent each reaction and k_i to represent the corresponding rate constant.

2. Let a, b, c, d denote the concentrations of the corresponding species A, B, C, D. Write down the corresponding system of differential equations that track the rate of change of a, b, c, d.

3. Use MATLAB to numerically simulate the system of equations. Use initial conditions of zero for all species (this is ok due to the inflow) and simulation from $t = 0$ to $t = 4$ You can download the templates `lab1_driver.m` and `lab1_model.m` to get you started

4. Make a plot of the solutions. Your plot should look like:



5. Briefly describe the dynamics.

6. Determine the steady-state concentrations using your numerical solutions.