A Final Example:

A 80L reactor has stream #1 flowing at 10 L/min containing 50 mM "A", and the reactor is initially filled with this solution. At t = 0, stream #2 commences at 6 L/min containing 20 mM "B". In the reactor "A" and "B" react according to the following:

$$2A + B \rightarrow 3C$$

The rate of reaction depends only on the concentration of "B":

$$R_B = -kC_B$$

Why does it make sense that the rate of reaction might depend only on B?

Write differential equations for the concentrations of A, B, and C with time, and provide the initial conditions needed to solve these equations. The densities remain the same throughout the process, and the value of k is 0.4 min^{-1}.

(Note: there is an exiting stream, and therefore A, B, C do not remain—forever—in the reactor.)