

Chemistry 5850 Summer 2004 Assignment 11

Due: Tuesday, July 27

Weight of this assignment: 36 marks

1. Using xpp, carry out a few simulations of the system of DDEs

$$\begin{aligned}\dot{c} &= es - c, \\ \dot{e} &= -es + c - \gamma e + \frac{\phi_{\max} s_{\tau}^n}{\sigma^n + s_{\tau}^n}, \\ \dot{s} &= \kappa - es + \alpha c.\end{aligned}$$

Try to find at least two qualitatively different kinds of behavior. [6 marks]

Hint: Things tend to get interesting when you use large delays and at least moderately large values of n (≥ 4). It may also help to keep ϕ_{\max} fairly small.

2. Analyze the stability of the equilibria for the following variation on the logistic equation:

$$\dot{x} = x(1 - x_{\tau}).$$

[15 marks]

3. Analyze the stability of the equilibria for the following system of DDEs:

$$\begin{aligned}\dot{x} &= 1 - ax + by_{\tau}, \\ \dot{y} &= 1 - y.\end{aligned}$$

[15 marks]