XPPAUT Tutorial IV for Math 865L

Chiu-Yen Kao

April 20, 2010

In this week, we study Goldbetter model for the mitotic oscillator involving cyclin and cdc2 kinase.

1 Goldbetter Model

The kinetic equations are

$$\begin{array}{rcl} \frac{dC}{dt} & = & v_i - v_d X \frac{C}{K_d + C} - k_d C \\ \frac{dM}{dt} & = & V_1 \frac{1-M}{k_1+(1-M)} - V_2 \frac{M}{K_2+M} \\ \frac{dX}{dt} & = & V_3 \frac{(1-X)}{K_3+(1-X)} - V_4 \frac{X}{K_4+X} \end{array}$$

with

$$V_1 = \frac{C}{K_c + C} V_{M1}, \quad V_3 = M V_{M3}.$$

First set of parameters:

$$K_i = 0.005 (i = 1 - 4), V_{M1} = 3, V_2 = 1.5, V_{M3} = 1, V_4 = 0.5$$

Second set of parameters:

$$K_i = 10 (i = 1 - 4), V_{M1} = 3, V_2 = 1.5, V_{M3} = 1, V_4 = 0.5$$

HW: Generate Fig 2,3 and 4 in Goldbeter paper and report the parameters you choose.