

Exercise #5

MB&B 361/562

Due: before class on Tuesday, February 20, 2024

Please upload it to Canvas Box (title: LastnameFirstname_Exercise5). You can scan handwritten parts.

This exercise is based on the reading of a 2011 Cell paper that details the modeling of the cell cycle using sets of coupled ordinary differential equations.

1. (3 pts) Read the introduction of Ferrel *et al.* 2011 “Modeling the Cell Cycle: Why Do Certain Circuits Oscillate?”. Describe how the CDK1/APC system captures the cell cycle oscillations.
2. (3 pts) Read the Bistable trigger section and describe how this model leads to oscillations using the 2-ODE model.
3. Write a script that solves the bistable trigger two-ODE model of CDK1 and APC regulation and plot the phase space and the evolution of oscillations. Feel free to use the bistableODE.mlx script. How does turning (increasing/decreasing) parameters affect the oscillation cycles. What happens when you set = 0?