

Course Control and System Theory of Rational Systems Motivated by the Life Sciences

Homeworkset 3

Date issued: 27 September 2018.

Date due: 4 October 2018.

1. Consider the system you have selected for Homework Set 1. Describe the inputs of the system, the external concentrations and, if present, the enzyme concentrations. Can the inputs be influenced by a chemist or a biochemist?
2. Describe which components of the state or functions of the state appearing in the system equations, can in principle be observed. Describe the flows which flow out of the system.
3. What are the dominant functions of the system, linear functions, polynomial functions, or rational functions? Why did the authors of the paper from which the system is taken, make the choices for these functions? Are arguments mentioned or are the choices a modeling approximation without arguments?
4. If the system you have selected for Homework set 1 is a positive system, then check the conditions of Theorem 5.7.3 for the system to be a positive system, meaning that the positive orthant is a forward invariant set.
5. If the system is a positive system, then describe the decomposition of the positive system in terms of irreducible subsystems and their interconnection, according to the description of Section 5.8?

Reading advice for Lecture 3

Please read of the lecture notes the Sections 5.1, 5.2, 5.3, 5.7, and 5.8.

Reading advice for the future Lecture 4

Please read of the lecture notes the Sections 5.4, 5.5, and 5.6; and Appendix B (still has to be extended). As mentioned before, this is a recommendation only.