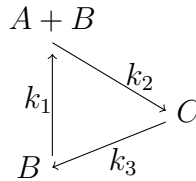


# Homework 13

Math 469 (section 500), Spring 2019

This homework is due on Thursday, April 18.

1. Suggest a final-exam problem related to ODEs.
2. Consider the following reaction network:



- (a) Write down the mass-action differential equations for this network.
  - (b) Determine the conservation laws.
  - (c) Determine how the number of positive equilibria  $(A, B, C) \in \mathbb{R}_{>0}^3$  depends on  $k_1, k_2, k_3$  (assume that  $k_1, k_2, k_3 > 0$ ).
  - (d) Does the Deficiency Zero Theorem apply? Does it confirm your answer to (c)?
3. Read Dulac's Criterion (Theorem 5.9); note that  $Bf$  denotes the product of  $B$  and  $f$ . In Example 5.17, what are the functions  $Bf$  and  $Bg$ ?
  4. Section 6.10 #10, 12, 24
  5. (This part of your homework pertains to your final project) *You may write this together with your project partner; do not staple this to the rest of your homework.*
    - (i) Review the comments you received on the draft of your final paper.
    - (ii) Revise your draft, so that it takes into consideration all comments you received, and also does all of the following:
      - (a) describe the scientific/mathematical background,
      - (b) state the main scientific/mathematical questions addressed in the paper,
      - (c) describe the authors' objectives and what they do to achieve them,
      - (d) state at least one main mathematical result (together with all necessary definitions) – *this is a statement, not a description*,
      - (e) interpret the significance of the result in terms of the authors' objectives,
      - (f) explain the scientific/mathematical conclusions the authors reached, and
      - (g) **extend the results in the paper and/or critique some scientific or mathematical aspect of the paper.**