

MATH 213 - Homework #7 (Due 3/29)

1. Problems 5, 6 (a) and (e).
2. Consider the following competing-species model:

$$\begin{aligned}x' &= (1 - x - y)x \\y' &= (4 - 3y - 7x)y.\end{aligned}$$

Perform a qualitative analysis (nullclines, type and stability of steady states). Describe the behavior you observe. Attach also a `pplane` output.

3. Consider the following cooperative-species model:

$$\begin{aligned}x' &= (1 - x + 2y)x \\y' &= (3 - 5y + x)y\end{aligned}$$

Perform a qualitative analysis (nullclines, type and stability of steady states). Describe the behavior you observe. Attach also a `pplane` output.

4. Consider the following predator-prey model, with the prey population following a logistic model:

$$\begin{aligned}x' &= (0.4 - 0.001x - 0.01y)x \\y' &= (-0.3 + 0.005x)y\end{aligned}$$

Use `pplane` to analyze the system: find the nullclines and the type and stability of steady-states. Attach also graphs of x and y versus t . Describe the behavior you observe. Compare this situation with the classical predator-prey model.

5. Problem #14 (p. 154), parts (d),(e). (Parts (a)-(c) were assigned in HW#4.)