

Recitation 19

1. Without looking at your notes from the lecture, write down the steps we use to determine the long-term behavior of a system with multiple equilibria.

2. Let R be the size of a population of rabbits, and S the population of sheep in the same area. The *Lotka–Volterra competition model* for these species might look like the following:

$$R' = 24R - 2R^2 - 3RS$$

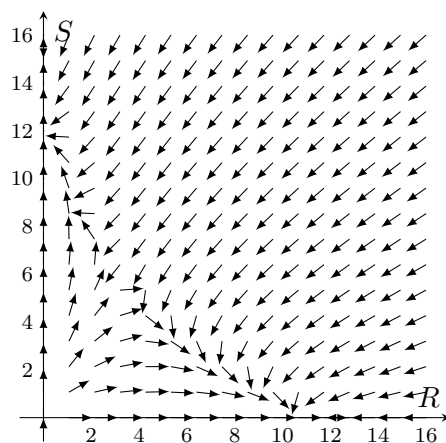
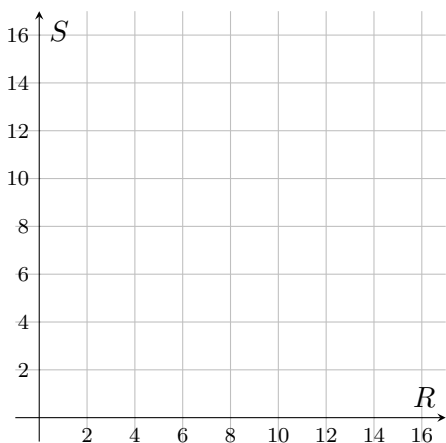
$$S' = 15S - S^2 - 3RS$$

(a) Interpret what each of the six coefficients in the change equations mean.

- (b) Use the steps we have seen in class to determine the natures of all equilibrium points and the long-term behavior of the system. Does your answer agree with the vector field for the system?

$$R' = 24R - 2R^2 - 3RS$$

$$S' = 15S - S^2 - 3RS$$



3. Consider the predator-prey system given by

$$X' = X(10 - X) - \frac{4XY}{2 + X} \qquad Y' = 4Y - \frac{3Y^2}{X}$$

Determine the natures of all equilibrium points and the long-term behavior of the system. Does your answer agree with the vector field for the system?

