

MATH 449 Homework 6 - Due Friday April 20.

1. Text: 7.2.10
2. Text: 8.1.1 (a)
Do typical phase portraits for $\mu < 0$, $\mu = 0$, and $\mu > 0$, and use the web based phase portrait utility demonstrated in class.
3. Text: 8.1.3
4. Text: 8.1.10

Given the system

$$\dot{S} = r_S S \left(1 - \frac{S}{K_S} \frac{K_E}{E}\right) \quad (1)$$

$$\dot{E} = r_E E \left(1 - \frac{E}{K_E}\right) - P \frac{B}{S} \quad (2)$$

Use the nondimensionalized parameters

$$x = \frac{S}{K_S} \quad y = \frac{E}{K_E} \quad \tau = r_S t$$

You should get (demonstrate how)

$$\dot{x} = x(1 - x/y) \quad (3)$$

$$\dot{y} = \rho y(1 - y) - \frac{\mu}{x} \quad (4)$$

where $\dot{x} = dx/d\tau$, $\rho = r_E/r_S$ and $\mu = \frac{P B}{r_S K_S K_E}$.

Again, use the web-based phase portrait utility to draw phase portraits.