

You must show your work to get full credit.

There are two competing species of aquatic snails in a large aquarium. Let $x(t)$ be the number of species 1 and $y(t)$ the number of species 2 t months after the aquarium is set up. Assume

$$\frac{dx}{dt} = .1x \left(\frac{100 - x - .25y}{100} \right)$$

$$\frac{dy}{dt} = .07y \left(\frac{300 - 2x - y}{300} \right)$$

1. Find all four equilibrium points.

To set the fourth solve

$$x + .25y = 100$$

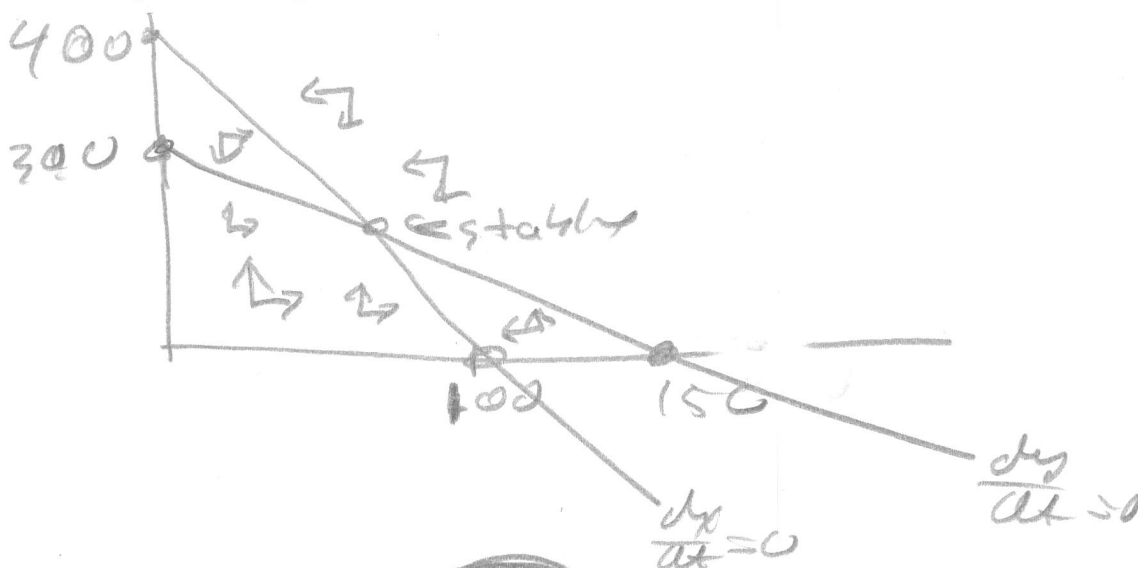
$$2x + y = 300$$

To set $x = 50$
 $y = 200$

Those we know already

- (0, 0)
- (100, 0)
- (0, 300)
- (50, 200)

2. Draw the phase diagram.



3. Do the two species of snails coexist, or is there competitive exclusion? (Circle the correct one.)