$$\begin{cases} \dot{x} = xa - bxy \\ \dot{y} = cxy - ey \end{cases} \qquad a, b, c, e > 0$$

① FP

$$\left.\begin{aligned} x(a - by) = 0 \\ y(cx - e) = 0 \end{aligned}\right\}$$

1) $x = y = 0$ — everything is dead

2) $a - by = 0$ — oscillations

$y = \frac{a}{b}$

$x = \frac{e}{c}$

② Stability

$$J = \begin{pmatrix} a - by & -bx \\ cy & cx - e \end{pmatrix}$$

1) $J = \begin{pmatrix} a & 0 \\ 0 & -e \end{pmatrix}$, $\lambda = \{a, -e\}$

saddle

2) $J = \begin{pmatrix} 0 & -\frac{be}{c} \\ \frac{ac}{b} & 0 \end{pmatrix}$

$\lambda^2 + ae = 0$

$\lambda = \pm i\sqrt{ae}$

center

③

$x = 0, y > 0$ — extinction:

$\dot{y} = -ey$

$y = y_0 + \exp(-et) \to 0$

$x > 0, y = 0$ — uncontrollable growth:

$\dot{x} = a x$

$x = x_0 + \exp(a t) \rightarrow \infty$