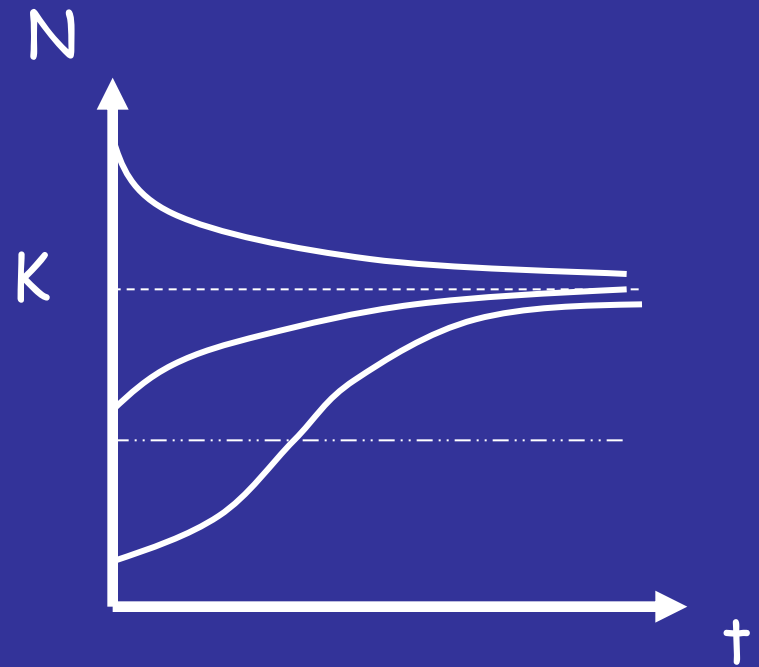
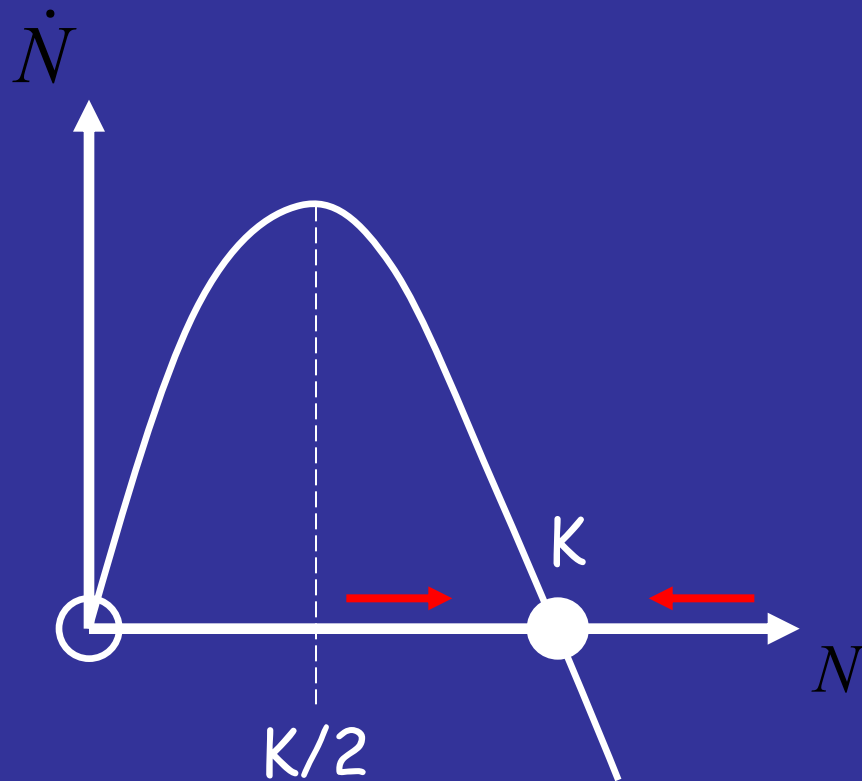


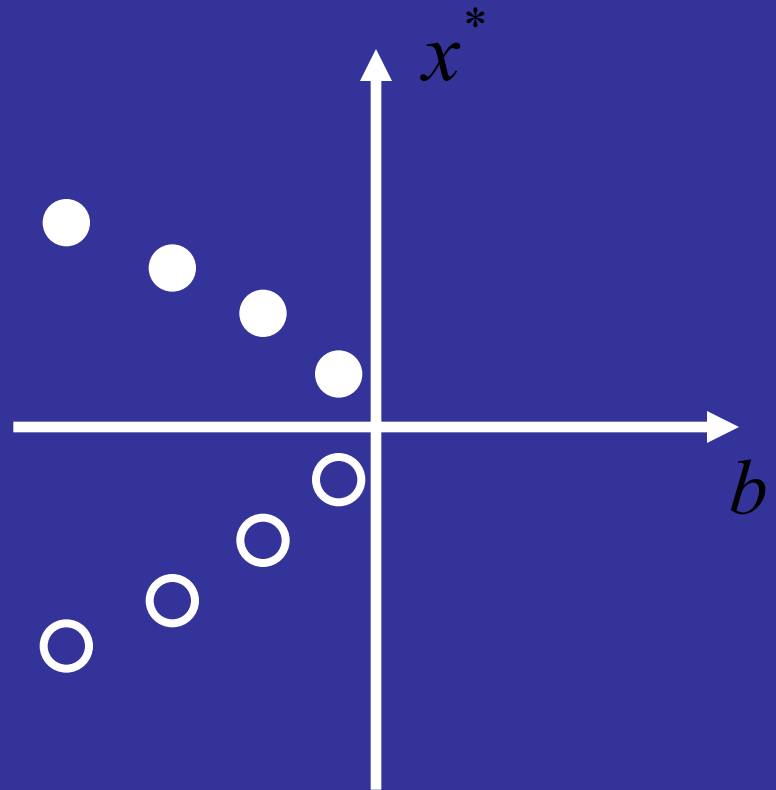
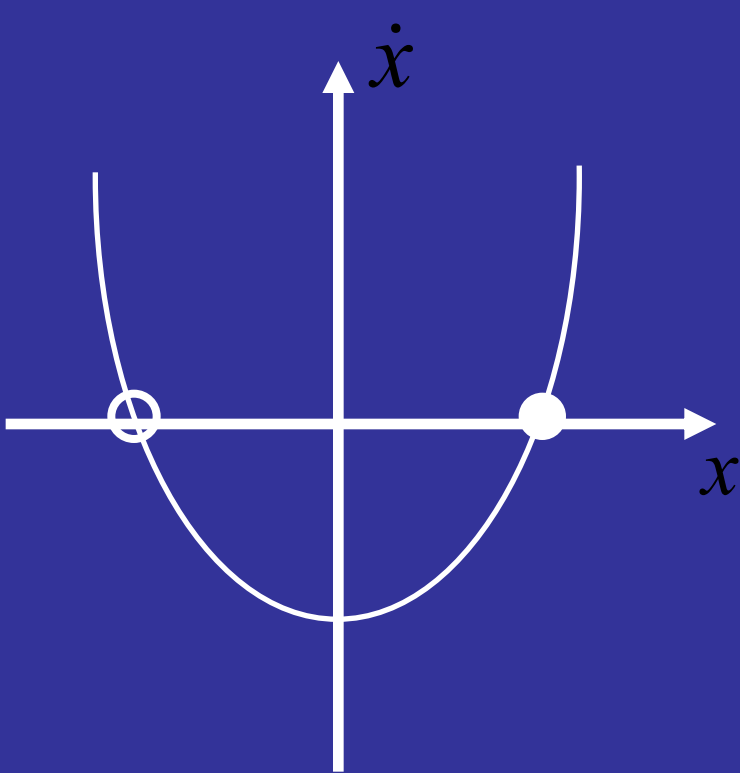
Logistic Differential Equation

$$\dot{N} = rN \left(1 - \frac{N}{K} \right)$$



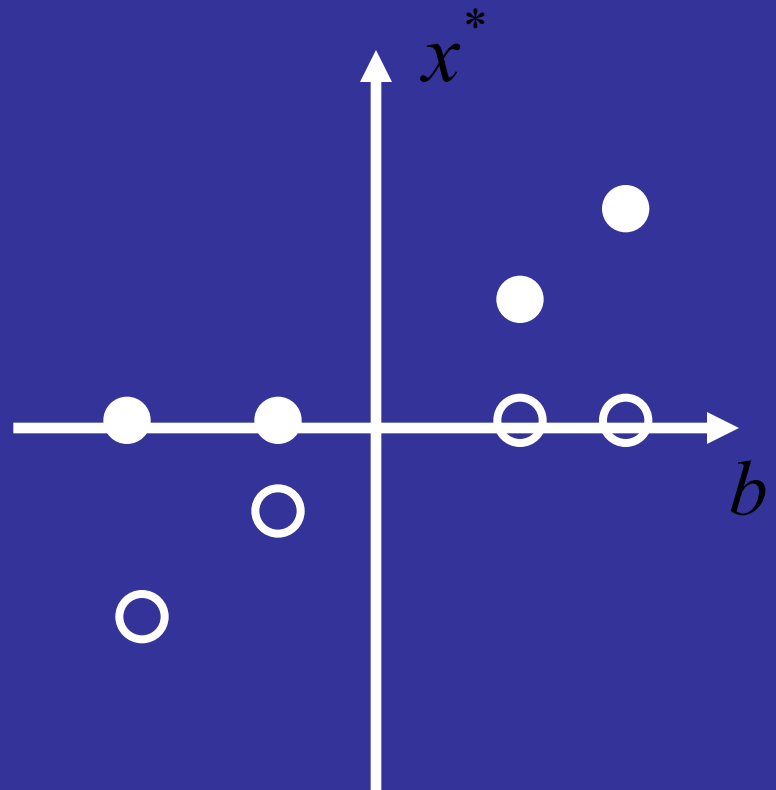
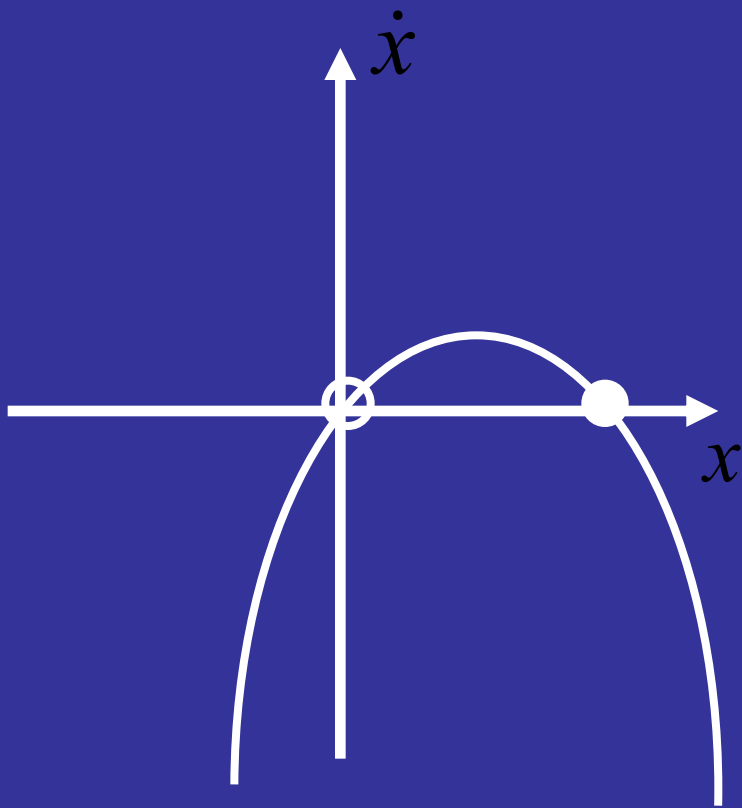
Saddle Node Bifurcation (1-dim)

Prototypical example: $\dot{x} = b + x^2$



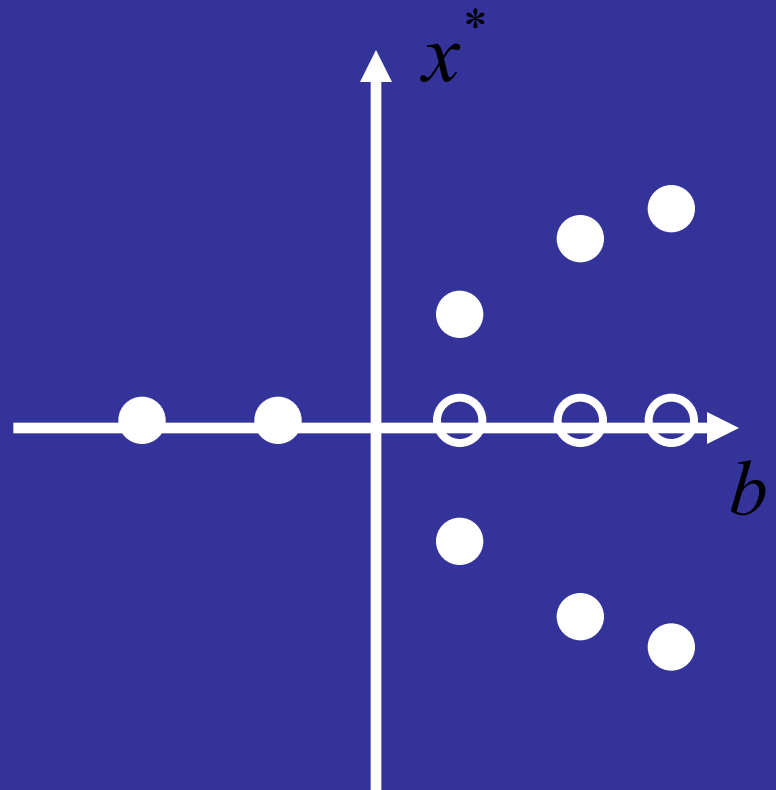
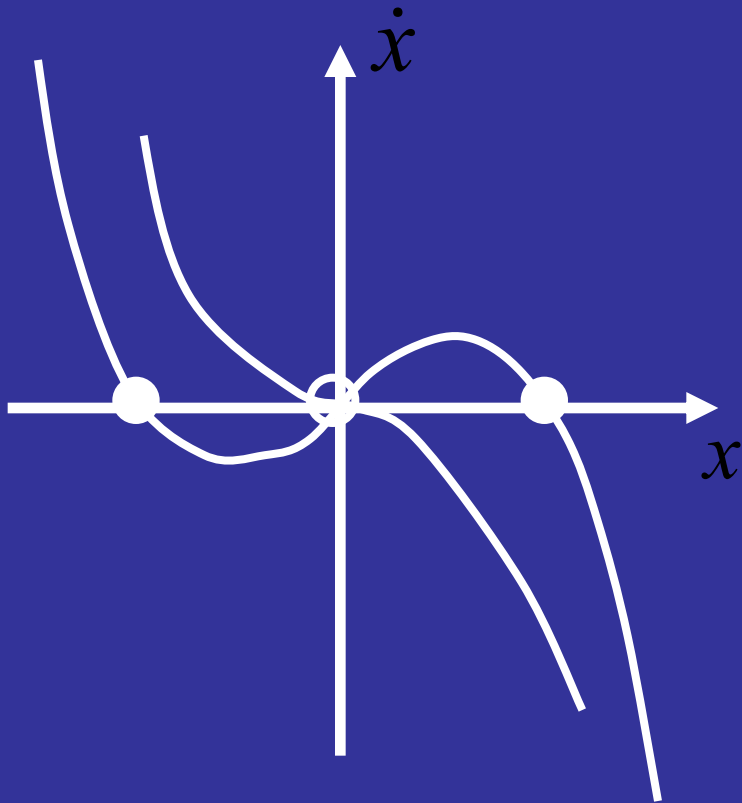
Transcritical Bifurcation

Prototypical example: $\dot{x} = bx - x^2$



Pitchfork Bifurcation

Prototypical example: $\dot{x} = bx - x^3$



Dynamics of Two Dimensional Systems

1. Find the fixed points in the phase space!
2. Linearize the system about the fixed points!
3. Determine the eigenvalues of the Jacobian.

Eigenwerte λ	Normalform von A	Name des Fixpunktes	Trajektorienverlauf
	$\begin{pmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{pmatrix}$	stabiler Knoten	
	$\begin{pmatrix} \lambda & 0 \\ 0 & \lambda \end{pmatrix}$		
	$\begin{pmatrix} \lambda & 1 \\ 0 & \lambda \end{pmatrix}$	entarteter stabiler Knoten	
	$\begin{pmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{pmatrix}$	Sattel	
	$\begin{pmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{pmatrix}$	instabiler Knoten	
	$\begin{pmatrix} \lambda & -i\omega \\ i\omega & \lambda \end{pmatrix}$	stabiler Strudel	
	$\begin{pmatrix} \lambda & -i\omega \\ i\omega & \lambda \end{pmatrix}$	instabiler Strudel	
	$\begin{pmatrix} 0 & -\omega \\ \omega & 0 \end{pmatrix}$	Wirbel (Zentrum)	
	$\begin{pmatrix} \lambda & 0 \\ 0 & 0 \end{pmatrix}$	—	