

Group 1

For each of the following equation:

- Find the Nullclines and plot them on Desmos to find fixed points. What are the possible cases for μ ?
- Solve exactly for the fixed points and confirm the cases that you found from the Nullclines.
- Find the Jacobian and discuss the stability of the fixed points in each of the different cases (if fixed points exist)
- Classify the type of bifurcation that you think is happening.
- Plot phase planes for each case including the bifurcation case. Can you explain what you see? Do you see ghost points and bottlenecks? Can you identify the manifolds?

$$\begin{aligned}\dot{x} &= \mu x - x^2 \\ \dot{y} &= -y\end{aligned}$$

Your goal is to present the problem to the class. You might want to plot the pictures on a laptop that can be connected to the classroom projector.

Group 2

For each of the following equation:

- Find the Nullclines and plot them on Desmos to find fixed points. What are the possible cases for μ ?
- Solve exactly for the fixed points and confirm the cases that you found from the Nullclines.
- Find the Jacobian and discuss the stability of the fixed points in each of the different cases (if fixed points exist)
- Classify the type of bifurcation that you think is happening.
- Plot phase planes for each case including the bifurcation case. Can you explain what you see? Do you see ghost points and bottlenecks? Can you identify the manifolds?

$$\begin{aligned}\dot{x} &= \mu x - x^3 \\ \dot{y} &= -y\end{aligned}$$

Your goal is to present the problem to the class. You might want to plot the pictures on a laptop that can be connected to the classroom projector.

Group 3

For each of the following equation:

- Find the Nullclines and plot them on Desmos to find fixed points. What are the possible cases for μ ?
- Solve exactly for the fixed points and confirm the cases that you found from the Nullclines.
- Find the Jacobian and discuss the stability of the fixed points in each of the different cases (if fixed points exist)
- Classify the type of bifurcation that you think is happening.
- Plot phase planes for each case including the bifurcation case. Can you explain what you see? Do you see ghost points and bottlenecks? Can you identify the manifolds?

$$\begin{aligned}\dot{x} &= \mu x + x^3 \\ \dot{y} &= -y\end{aligned}$$

Your goal is to present the problem to the class. You might want to plot the pictures on a laptop that can be connected to the classroom projector.

Group 4

For each of the following equation:

- Find the Nullclines and plot them on Desmos to find fixed points. What are the possible cases for μ ?
- Solve exactly for the fixed points and confirm the cases that you found from the Nullclines.
- Find the Jacobian and discuss the stability of the fixed points in each of the different cases (if fixed points exist)
- Classify the type of bifurcation that you think is happening.
- Plot phase planes for each case including the bifurcation case. Can you explain what you see? Do you see ghost points and bottlenecks? Can you identify the manifolds?

$$\begin{aligned}\dot{x} &= y - 2x \\ \dot{y} &= \mu + x^2 - y\end{aligned}$$

Your goal is to present the problem to the class. You might want to plot the pictures on a laptop that can be connected to the classroom projector.