

Final

Friday, October 5, 2018 12:34 PM

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Last name:

First name:

BU or BG:

Problem 1 (5 points). The family of differential equations $x' = x^3 - a x$ depends on a parameter a . Sketch the corresponding bifurcation diagrams.

Problem 2 (5 points). Find the fixed points and their type and using any of the techniques learned in class, draw the phase portrait of

$$\begin{aligned}x' &= x(y + 2x - 2) \\y' &= y(y - 1)\end{aligned}$$

Problem 3 (5 points) Using any of the techniques learned in class, draw the phase portrait of

$$\begin{aligned}x' &= x + 2y \\y' &= -y\end{aligned}$$

Problem 4 (5 points): The system below is in polar coordinates. Draw the phase portrait of the system below, for values of a smaller, equal and bigger to all the values where a bifurcation occurs.

$$\begin{aligned}r' &= a r + r^3 - r^5 \\ \theta' &= 1\end{aligned}$$