

Problems Day 26, T 3/12/2024

Topic 12: Autonomous DEs (day 2)

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Problem 1. Consider $y' = y(2 - y) - h$, (h a constant).

(a) Draw the bifurcation diagram. (y vs. h)

(b) I'm growing alfalfa and the amount $y(t)$ is modeled by the equation in Part (a). Here h is the constant rate that I harvest the alfalfa to feed to my horses. If I harvest at too great a rate, the alfalfa population will plummet and my horses will go hungry.

Discuss sustainability of my farm in terms of the harvesting rate h .

(c) Identify any bifurcation points.

Problem 2. Consider $y' = y(2 - y)(a - y)$, where a is a constant. (a) Draw the bifurcation diagram. (y vs. a)

(b) For what values of a is this sustainable?

(c) Identify all the bifurcation points.

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