

Class notes for Math 503, Fall 2024

University of Delaware

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Notes for Multivariable Calculus and Calculus of Variations

Row and column operations to simplify determinant computations

[video1](#) (matrix with numbers, 10 min)

[video2](#) (matrix with symbols, 5 min)

Note how row/col operations affect determinants.

Notes for Dynamical Systems

The videos are of lectures in 2022 and may be different from what I do in class in 2024.

1. Introduction ([pdf](#))
2. First Order Linear Systems ([pdf](#))
([video](#) of partial lecture - 26 min)
3. Elementary properties of autonomous systems ([pdf](#)),
([video1](#) - 13 min), ([video2](#) - 36 min)
4. Linearization around fixed points ([pdf](#)),
([video1](#) - 11min), ([video2](#) - 25 min)
5. Closed orbits, Duluc's theorem and the Poincare-Bendixson theorem ([pdf](#))
(Duluc's criterion I [video1](#) - 24min) (Duluc's criterion II [video2](#) - 31min)
(PB theorem I [video3](#) - 16 min) (PB theorem II [video4](#) - 12 min)
6. Nullclines, trapping regions, phase portrait ([pdf](#))
([video1](#) - 38 min), ([video2](#) - 48min), ([video3](#) - 49min), ([video4](#) - 29min)
7. Torqued damped pendulum
([video1](#) - 20min), ([video2](#) - 36min)