Topic List for Report No. 2

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1 Possible Topics

1.1 Three-body problem or generally the n-body problem

- https://en.wikipedia.org/wiki/Three-body_problem
- https://en.wikipedia.org/wiki/N-body_problem
- take the initial velocities and positions of 3 point masses
- find their following movement according to Newton's law of motion and gravitation
- some special case solutions exist for the 3-body problem

Sources:

1. https://www.jstor.org/stable/j.ctt1r2fwt.9, 47 pages, book chapter, Scientific Biography of Poincare
2. https://www.jstor.org/stable/j.ctt7rk7v.8, 87 pages, book chapter, Number Crunching / Computation Book
3. https://www.jstor.org/stable/2661357, 22 pages, journal article, periodic solution to three-body problem

1.2 Pendulum

- https://en.wikipedia.org/wiki/Pendulum
- https://en.wikipedia.org/wiki/Pendulum_(mathematics)
- describe the movement of a pendulum
- has many important applications in physics etc

Sources:

1. https://www.jstor.org/stable/j.ctt13x0kt6.10, 16 pages, book chapter, I. Newton: The Physics of the Pedulum
2. https://www.jstor.org/stable/j.ctvcmxp4x.9, 48 pages, book chapter, Nonlinear Systems of Differential Equations in the Plane

1.3 Lotka-Volterra Equation

- https://en.wikipedia.org/wiki/Lotka%E2%80%93Volterra_equations
- nice differential equation
- easy to explain and to model
- pig oscillations as different example

Sources:

1. https://www.jstor.org/stable/10.2307/26464246, 4 pages, journal article, A. J. Lotka and the origins of theoretical population ecology
2. https://www.jstor.org/stable/23328998, 14 pages, journal article, contribution of L-V to modern biomathematics
3. https://www.jstor.org/stable/3219158, 14 pages, journal article, L-V 3-species food chain
4. https://www.jstor.org/stable/3213008, 8 pages, journal article, on L-V predator prey models
5. https://www.jstor.org/stable/2096748, 31 pages, journal article, L-V population models

2 General Info for Report

- History
- Implications
- Analytic approaches to solving
- Numerical approaches to solving
- Numerical simulations done by me
- Phase diagrams or portraits or phase space
- other applicable visualizations
- Fixed points