Computational Physics Project 1: Pendulum

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1. Phase space of nonlinear pendulum

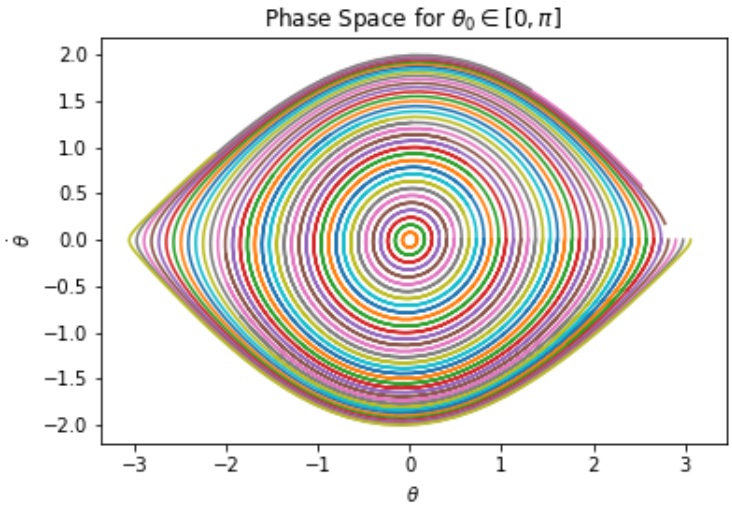

Figure 1: Plots of trajectory $(\theta, \dot{\theta})$, for many values of $\theta_0 \in [0, \pi]$

2. Phase space of linear pendulum

3. Pendulum with driving force, $\gamma k^2 cos(\omega t)$

4. Exploration of driven system
For fixed θ and $\dot{\theta}$, how do the real and phase space trajectories vary with γ

5. Identifying (θ_0, γ) **for which the motion diverges**

6. Driven pendulum with damping $\ddot{\theta} + 2\beta\dot{\theta} + k^2 sin\theta = \gamma k^2 cos(\omega t)$

7. Spectral analysis

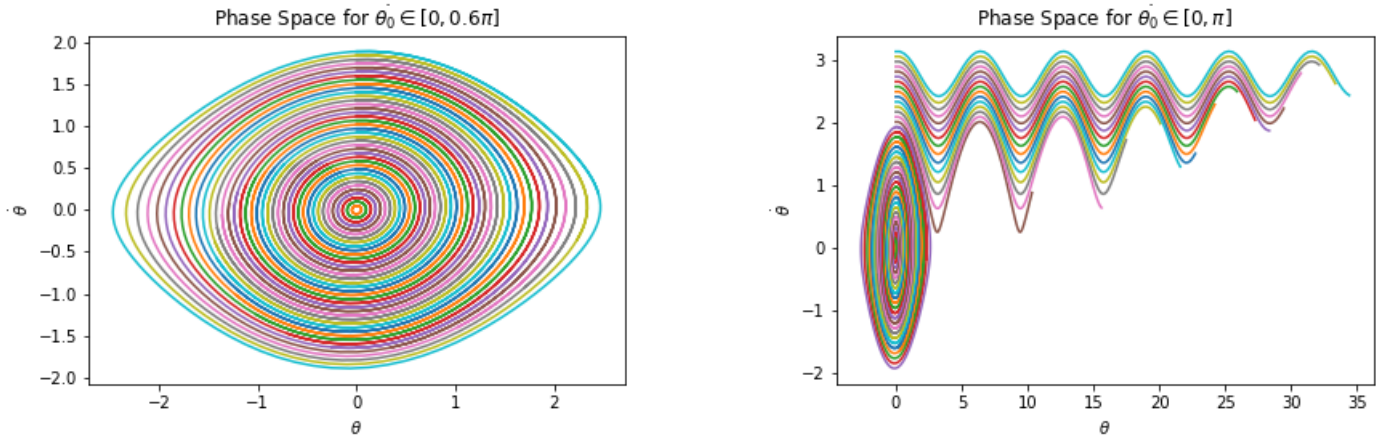

Figure 2: Trajectory for various $\dot{\theta}$

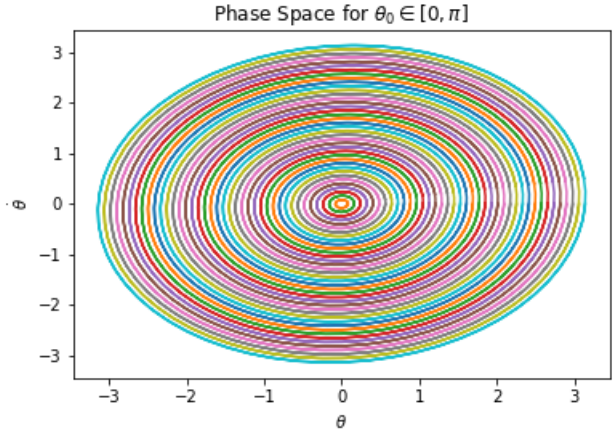

Figure 3: Plots of linearized trajectory $(\theta, \dot{\theta})$, for many values of $\theta_0 \in [0, \pi]$