PHYS4300 Numerical Methods and Scientific Computing

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HW 3
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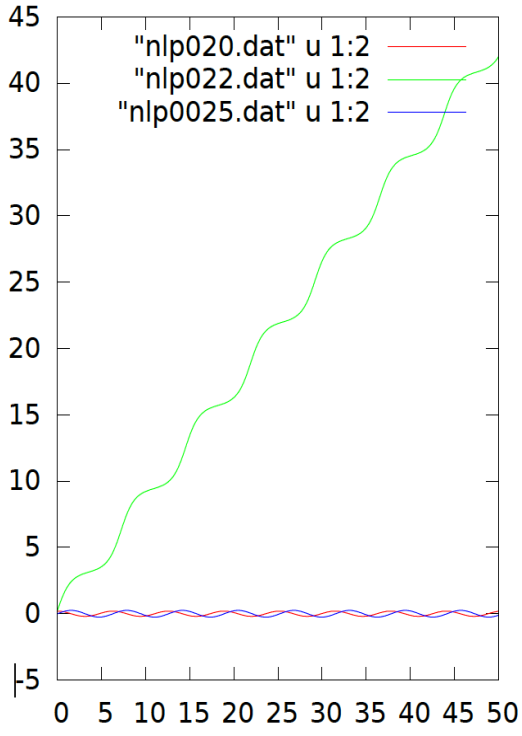
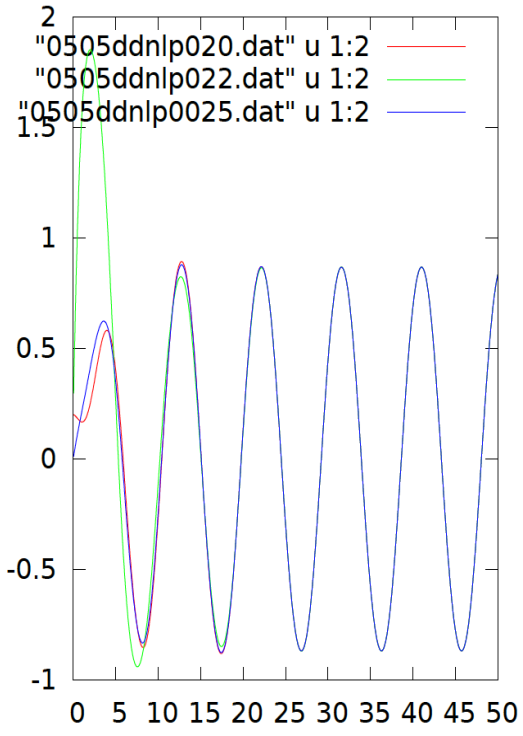
Solution. *Problem 1.* This program uses the Verlet method to show the time evolution of both the non-linear pendulum with parameters $\gamma = 0.0, a_0 = 0.0$, and the damped-driven non-linear pendulum with parameters $\gamma = 0.5, a_0 = 0.5, 1.2$. The first plots show the difference between the non-linear pendulum orbits and damped driven non-linear pendulum ($a_0 = 0.5$) orbits for initial conditions $(x = 0.2, v = 0.0), (x = 0.2, v = 2.0)$, and $(x = 0.0, v = 0.25)$. I have left the labels on these graphs. See pdf for higher resolution.





The following image shows the evolution of the damped driven non linear pendulum for $\gamma = 0.5, a_0 = 1.2$, or the chaotic case. The limit cycle is also shown, as well as, two different poincare sections (horizontal slices of the $3D$ limit cycle). $\square$