# Session 8

## Strings + things

2. yes I pretty much just slightly modified the For-loop

3. yes I just output the example

## Damped (undriven)

2. yes I mostly mimicked the testfilename.cpp

3. Undamped
   - $\alpha = 0$ , $\Theta_0 = 0.8$

   Underdamped
   - $\alpha = 0.25$, $\Theta_0 = 0.8$

Critically damped

- $\alpha = 2$, $\Theta_0 = 0.8$

Over-damped

- $\alpha = 4$, $\Theta_0 = 0.8$

* I really never changed $\Theta_0$, however if you set it to $\pi/2$ it tends to nice as well

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## Damped, Driven Pendulum

1). They are good because it can help isolate the phase of individual periods as well as elucidate effects of external forces.
It also shows at what period does the pendulum pick up a harmonic phase.

2) It becomes periodic
~ $t = 36$ seconds

3) yes because it only plots after harmonicity.
$f = 10^{-1} s^{-1}$

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## Looking for Chaos

2. You can plot it in the time domain & do a Fourier Transform to seperate fundamental frequencies

3. - Decreasing $\dot{\theta}$ stretchs phase space $\theta$ values
   - increasing $\dot{\theta}$ compact phase space $\theta$ values
   - Increasing $\theta$ takes away phase space periodicity
   - decreasing $\theta$ makes it more periodic