$\boxed{\text{Mathematica Homework \#4}}$

Email notebook to corbin@physics.ucla.edu
with a subject line: [Physics 105A]
on/or about Monday, 15 November

- In the first cell, enter your **name**, **student ID**, **email address** and the **assignment identifier** (eg. "HW 4") as text.
- 1) Find the response of a damped-oscillator (described by parameters β and ω_0) to the following driving forces:
  - i) $F[t]/m = \sin\left(n\frac{2\pi}{T}t\right)$
  - ii) $F[t]/m = \cos\left(n\frac{2\pi}{T}t\right)$

  where n is an integer.
- 2) Suppose a single period of a periodic driving force is described by the function:

$$F[t]/m = \begin{cases} F_0 & 0 < t < cT \\ 0 & cT < t < T \end{cases}$$

  where F_0 is constant and $0 < c < 1$.
  - i) Find the Fourier Series representation of the driving force.
  - ii) Take $F_0 = 5.0$, $c = 0.7$ and $T = 1.7$ Plot a_n and b_n for $0 \leq n \leq 20$.
  - iii) To get an idea of how the Fourier Series works, make a series of plots of the (Fourier representation of the) driving force, starting with just the $n = 0$ terms in the first plot, adding the $n = 1$ terms in the next plot and so on.
- 3) Suppose we subject a damped-oscillator(say, $\omega_0 = 2\pi$ and $\beta = 0.05\omega_0$, starting at rest at equilibrium) to the driving force we just considered. How will the system respond? Plot $x[t]$ vs. t for 6 cycles of the driving force.
- 4) **Marion 3-38** Any opportunity to use Green's method is probably good. I don't think this one will be terribly difficult in Mathematica.