PHYS2502 Mathematical Physics Lab #6 27 Feb 2022

This lab assignment is at 8am, the morning after the date shown, although you should able to complete it easily before the end of the lab period. When you're done, upload your code to the github *repository, and a PDF of your output to the* canvas *page for the course.*

The point of this exercise is to complete the discussion we had in class on Thursday 23 Feb, and make the four plots shown in Figures 3.12 and 3.13 in the book. You can get to the necessary equations any way you want. For example, you could type in (3.38) and solve for the coefficients, or you could type in the coefficients (3.39) directly, or you could even go back to the differential equations (3.36) and solve them analytically. (If you use MATHEMATICA, just use DSolve, but with two differential equations and four separate initial conditions.) Your plots should use $\omega_0 = 2\pi$ so that the fundamental period $T = 2\pi/\omega_0 = 1$.

After you've made these four plots, try to make one that also shows the oscillations in one (or both) normal modes (as in either of the plots in Figure 3.13) by using zero position initial conditions but nonzero initial velocities. That is, try to "launch" the masses into normal modes when they start out at their equilibrium points.

If you use MATHEMATICA you may want to use Simplify after ComplexExpand to turn expressions like $e^{i\omega_0 t}$ into cosines and sines. Remember that Plot cannot deal with complex expressions.

The book uses solid and dashed line textures because it had to be in black and white, but you are welcome to use colors. I suggest you also try to add "legends" to the plot to label the different lines. (I did this for the figures in the book.)