Phys 410 – Homework #3

All numbered problems from Taylor.

1) 5.13 (3 pts)
2) 5.26 (3 pts)
3) 5.49 (3 pts) (computer problem)
4) 5.53 (a and b) (6 pts) (computer problem, this is a continuation of problem 5.49.)

5) The Green's function for a linear oscillator that starts from rest is

$$G(t,t') = \begin{cases} \frac{1}{m\omega_1} e^{-\beta(t-t')} \sin(\omega_1(t-t')), \text{ for } t \geq t' \\ 0, \text{ for } t < t' \end{cases}$$

The solution for a forced oscillator with a forcing function F(t) is then

$$x(t) = \int_{-\infty}^{t} F(t')G(t,t')dt'$$

a) (3 pts) Calculate x(t) for an oscillator for the case where it is <u>undamped</u>, has natural frequency ω_0, and is driven by the following force function: it is zero before t = 0, is constant with value F_0 for $0 < t < \tau$, where $\tau = 2\pi/\omega_0$, and is zero again for $t > \tau$.
b) (3 pts) Make a plot or sketch of the resulting motion of the oscillator.
c) (3 pts) Give an intuitive physical explanation for why the oscillator behaves the way it does for time $t > \tau$.