Classical Mechanics - PHYS 310 - Fall 2013 HW # 5
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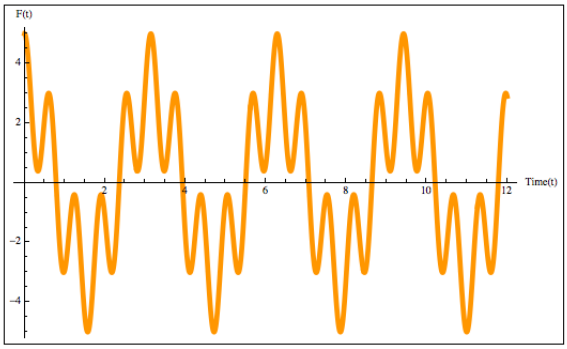
Please return it by the 27th of September 2013

- **Problem 1** The amplitude of an oscillator changes from 8mm to 3 mm in 200s, What is the value of the sampling constant β for this system?

10 points

- **Problem 2**

Consider a Harmonic Oscillator driven by an external periodic force which changes with time as shown below.



This external force whown in the above figure can be written as:

$$F(t) = 3Cos(\omega t) + 5Cos(3\omega t) \tag{1}$$

20 points

In this equation $\omega = \omega_0/2$, where ω_0 is the natural frequency of the system. The damping factor of the system $\beta = 0.2\omega_0$. Find the equation for the steady state of this system.

- **Problem 3**

The damping factor for a spring suspension system is $0.25\omega_0$. Find the resonant frequency and the phase angle for the system, when it is driven by an external driving force with a frequency $\omega = \omega_0/3$

10 points

- **Problem 4**

Given that the amplitude of the damped harmonic oscillator drops to $1/e$ of its initial value after n complete cycles. Show that the ratio of period of oscillation to the pariod of the same oscillation with no damping is given by:

$$\frac{T_d}{T_0} = \left(1 + \frac{1}{4\pi^2 n^2}\right)^{1/2} \sim 1 + \frac{1}{8\pi^2 n^2} \tag{2}$$

15 points