

Phys 410

Fall 2015

Homework #4

Due Thursday 1 October, 2015

NOTE: EXAM #1 is October 15, 2015, Covering ~ chapters 1-6, 9 of Taylor

All problems are from Taylor, *Classical Mechanics*.

- 1) Problem 5.2 Small oscillations around the minimum of a potential
- 2) Problem 5.5 The different expressions for harmonic oscillation
- 3) Problem 5.11 Frequency and amplitude from 2 positions and speeds
- 4) Problem 5.13 Small oscillations
- 5) Problem 5.29 Period of a damped oscillator
- 6) Problem 5.33 Driven damped oscillations
- 7) Problem 5.36 Transient behavior of damped driven system
- 8) Problem 5.41 Half-power points near resonance
- 9) Problem 5.44 Another interpretation of Q
- 10) Problem 9.1 Buoyant force in an accelerating frame
- 11) The Green's function for a linear oscillator that starts from rest is given in the lecture summary. Use Green's method to calculate the position $x(t)$ for such an oscillator for the case where it is undamped, has natural frequency ω_0 , and is driven by an impulse force function. The force function has the following form: 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 $t > \tau$. Make a plot or sketch of the resulting motion of the oscillator. Give an intuitive physical explanation for why the oscillator behaves the way it does for $t > \tau$.

Extra Credit

- 1) Problem 5.39 Direct solution of the driven damped harmonic oscillator