

Applications of Classical Mechanics
Physics 350 2017W
Homework Assignment #1
Due: Friday, February 1, 2019 (by 5PM)

1. The Half Pipe (a.k.a. The Simple Pendulum) [3 points]

- (a) and (b) as in Problem 1.50 (Taylor).
(c) Repeat (b) but now plot the solutions between $t = 160$ s and $t = 170$ s. By adjusting the frequency of the approximate solution (Eq. 1.57 of Taylor) to $\omega_{eff} \simeq (1 - \epsilon)\omega$ determine the approximate value of ϵ where the solutions “phase up” (the two curves almost exactly overlap).

2. The Hoverocket [1 points]

Problem 3.8 (Taylor).

3. Multistage Rockets [2 points]

Problem 3.12 (Taylor).

4. The x^4 Oscillator [2 points]

Problem 4.29 (Taylor).

5. The Pendulum: Part II [3 points]

- (a) as in Problem 4.38 (Taylor).
(b) as in Problem 4.39 (Taylor).
(c) Compare the percentage change in τ derived with this approximation to the percentage change in ω you found in Problem 2. (Compare the same amplitude).

6. The Soap Bubble Problem [2 points]

Problem 6.19 (Taylor).

7. The Cycloid is an Isochrone [3 points]

Problem 6.25 (Taylor). In what sense is motion along this curve Harmonic motion?

8. Two Particles: Proof of Lagrange’s Equations in Any Coordinate System [1 point]

Problem 7.6 (Taylor).