H. Hergert
Facility for Rare Isotope Beams
and Department of Physics & Astronomy

MICHIGAN STATE
U N I V E R S I T Y

PHY422/820: Classical Mechanics

FS 2019
Midterm #2 Preparation

November 5, 2019

Problem P8 – Vertical Oscillators

Consider two equal masses m that are suspended from the ceiling using identical springs with constants k and unstretched length l. Assume that the masses are only allowed to move vertically.

1. Find the Lagrangian for the two masses in terms of the absolute positions of the two masses, as well as in terms of displacements of the system out of equilibrium. What is the advantage of the latter?

2. Show that the characteristic frequencies of the normal modes are

$$\omega_\pm^2 = \frac{(3 \pm \sqrt{5})k}{m}. \tag{1}$$