

Midterm Exam No. 02 (2026 Spring)

PHYS 510: CLASSICAL MECHANICS

School of Physics and Applied Physics, Southern Illinois University–Carbondale

Date: 2026 Mar 26

1. **(20 points.)** A pendulum consists of a mass m hanging from a pivot by a massless string of length a_2 . Let the pivot be massless and let it be constrained to move sinusoidally on a frictionless vertical line with amplitude a such that the position of the pivot is given by

$$x(t) = 0, \quad (1a)$$

$$y(t) = a \sin \omega_0 t. \quad (1b)$$

See Figure 1. For simplification, and at loss of generality, let us chose the motion of the pendulum in the plane containing the vertical line. Find the equations of motion of mass m in the small angle approximation.

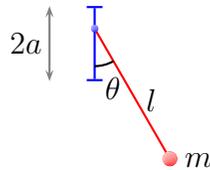


Figure 1: Problem 1.

2. **(80 points.)** Complete HW-08 by Tuesday April 14.