

PHYS 211 Homework Assignment

Chapter 15

Problem 1 An ideal, massless spring is hung vertically from a device that displays the force exerted on it. A heavy object is then hung from the spring and the display on the device reads W , the weight of the object, as both sit at rest. The object is then pulled downward a small distance and released. The object then moves in simple harmonic motion. What is the behavior of the display on the device as the object moves?

Problem 2 A 2.0 kg mass is attached to a spring with spring constant $k = 100 \text{ N/m}$. This mass oscillates across a frictionless horizontal surface, with no air resistance. When the mass is 2.0 meters away from its equilibrium position you measure that its moving with a speed of 5.0 m/s.

- (a) What is the energy of the system at the moment you measure the velocity?
- (b) What is the maximum amplitude of the oscillation?
- (c) What is the maximum speed of the oscillation?
- (d) What is the frequency of the oscillation?

Problem 3 A 200 g block on a spring is pulled a distance of 25 cm and released across a frictionless surface. The subsequent oscillations are measured to have a period of 0.70 s. At what position or positions is the block's speed 1 m/s?

Problem 4 Two masses oscillate in simple harmonic motion side-by-side. If they pass each other in opposite directions each time their displacement is one half their amplitude,

- (a) draw a graph of position versus time illustrating their motion;
- (b) what is their phase difference?

Problem 5 A spring with spring constant k is hung vertically from the ceiling. When an unknown mass m is hung from the spring, it stretches by an amount of 3.0 cm. If we set the block in motion, it oscillates with a frequency f . If we wish to make a simple pendulum that oscillates at the same frequency f , how long must it be?