Problem: 1

A 1.75-kg mass moves as a function of time as follows:

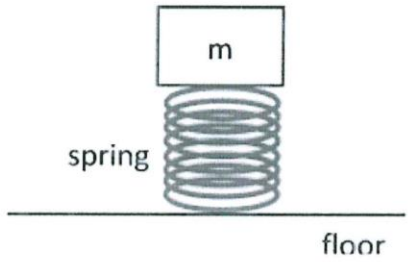
$$x = 4 \cos (1.33t + \pi/5)$$

Where distance is measured in meters and time in seconds,

(a) What is the amplitude, frequency, angular frequency, and time period of this motion?
(b) What is the equation of velocity of this mass.?
(c) What is the equation of the acceleration of this mass?
(d) What is the spring constant?

Problem: 2

A stiff spring k = 400 N/m has been attached to the floor vertically. A mass of 6.00 kg is placed on top of the spring as shown below and it finds a new equilibrium point. If the block is pressed downward and released it oscillates. If the compression is too big, however, the block will lose contact with the spring at the maximum vertical extension. Draw a free body diagram and find that extension at which the block loses contact with the spring

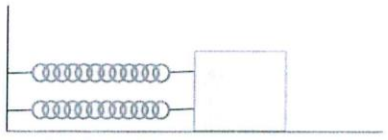


Problem: 3

A block of mass M is on a frictionless surface as shown below. It is attached to a wall by two springs with the same constant K. Initially the block is at rest and the springs unstretched. The block is pulled a distance A and then released.

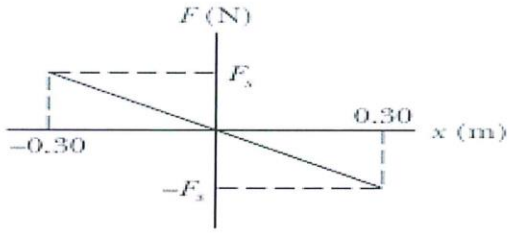
(a) What is the speed of the block as it passes through equilibrium?

(b) What is the angular frequency ω of the motion?



Problem: 4

A simple harmonic oscillator consists of a 0.50 kg block attached to a spring. The block slides back and forth along a straight line on a frictionless surface with equilibrium point x = 0. At t = 0 the block is at x = 0 and moving in the positive x direction. A graph of the magnitude of the net force on the block as a function of its position is shown in Fig. The vertical scale is set by Fs = 75.0 N. What are
(a) the amplitude and
(b) the period of the motion,
(c) the magnitude of the maximum acceleration, and
(d) the maximum kinetic energy?



Problem: 5

The scale of a spring balance that reads from 0 to 15.0 kg is 12.0 cm long. A package suspended from the balance is found to oscillate vertically with a frequency of 2.00 Hz. (a) What is the spring constant?
(b) How much does the package weigh?

Problem: 6

A transverse Wave on string is described by the following wave function:

$$y = (0.120\ m)\sin\left[\left(\frac{\pi x}{8}\right) + 4\pi t\right]$$

(a) Determine the transverse speed and acceleration at t= 0.200 s for the point on the string located at x = 1.60 m.

(b) What are the wavelength, period and speed of propagation of this wave?

Problem: 7

What phase difference between two identical traveling waves, moving in the same direction along a stretched string, results in the combined wave having an amplitude 1.50 times that of the common amplitude of the two combining waves? Express your answer in (a) degrees, (b) radians, and (c) wavelengths.

Problem: 8

Consider two waves that are superposing

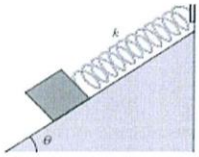
$$f_1(x) = A\sin(kx)$$
$$f_2(x) = A\sin\left(kx + \frac{\pi}{4}\right).$$

What is the wavelength of the resultant wave? What is the amplitude of the resultant wave?

Problem: 9

In the following figure a block weighing 14.0 N, which can slide without friction on an incline plane at an angle 0f Θ= 40^0, is connected to the top of the incline by a massless spring of unstressed length 0.450 m and spring constant 120 N/m

(a) How far the top of the incline is the block's equilibrium point?
(b) If the block is pulled slightly down the incline and released, what is the period of the resulting oscillations?



Problem: 10

In the following figure two identical springs of Spring Constant are attached to a block of mass 0.245 Kg. What is the frequency of oscillation on the frictionless floor? (K = 7580N/m)