

MA205 - Integral Calculus
Lesson 52: Spring Mass II

Problem Solving Problems

1. A spring with a 4 kg mass has natural length 1 m and is maintained stretched to a length of 1.3 m by a force of 24.3 N. If the spring is compressed to a length of 0.8 m and then released from rest,

(a) Find the position of the mass at any time t .

(b) Find the damping coefficient that would produce critical damping.

2. A 16 lb weight stretches a spring 4 ft. The spring-mass system is in a medium with a damping constant of 4.5 lb-sec/ft.

(a) What is the solution function describing the position of the mass at any time if the mass is released from 2 ft below the equilibrium position with an initial velocity of 4 ft/sec downward?

(b) Find the minimal spring constant that would produce underdamped behavior.

5. A 10kg mass is attached to a spring with spring constant of 140N/m. The mass is suspended in a viscous medium with a damping coefficient of 90 N-sec/m. The mass is started in motion from the equilibrium position with an initial velocity of 1m/sec in the upward direction. Formulate and solve an initial value problem that models the given system; graph and interpret the results.