Quiz #2 (Review of Classical Mechanics)

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Quantum Mechanics
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Prob. 1

A ball of mass M is thrown vertically into the sky from the ground, reaches height H, and returns to the ground. Plot the kinetic energy, the potential energy, and the Hamiltonian of the ball as a function of the height, h, for 0<h<H. Indicate the peak value in each plot. Use g for the gravitational acceleration coefficient.

Prob. 2

An object with mass M is attached to a spring with spring constant k. The force on the object exerted by the spring is F=-ky, where y represents the displacement of the object from its rest position (y=0). Determine the expression for y(t) if the object is let go from y = d with dy/dt = 0 at t=0. Ignore the gravitational force on the object.

Prob. 3

A string in a musical instrument having length L is fixed at y = 0 and y =L. Determine the expression for the frequency of the sound this string can produce. Assume the velocity of the sound wave inside the string is v.