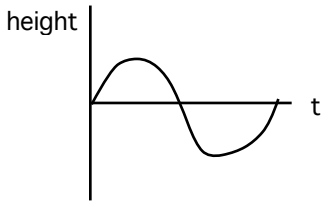
Post-Lab 15-3: **Energy Conservation**

The following questions are based on Lab 15-3: Energy Conservation. They all deal with a mass oscillating on a spring. "Position" refers to the height of the mass above the motion detector. Positive values are taken to mean "up."

Part 1: Position, Velocity and Acceleration verses time.

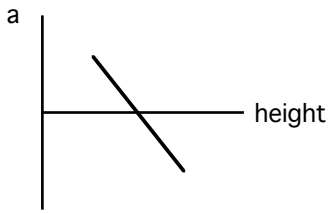
1. Sketch velocity vs time and acceleration vs time for the following height verses time graph.



2. Sketch free-body diagrams representing the forces acting on the mass at its highest point, the middle, and the lowest point. Draw vectors of an appropriate length and indicate in which direction the net force points.

Part 2: Velocity and Acceleration verses Position

3. Acceleration verses height should have looked like the following graph. Derive an expression for this function.



4. Velocity verses height was not a function. Sketch that graph and explain what it means.

Part 4: KE and PE verses position

5. Compare and contrast the graph of Kinetic Energy verses time with velocity verses time.

6. Compare and contrast the graph of Potential Energy verses time with height verses time. (Do this for the gravitational PE only.)

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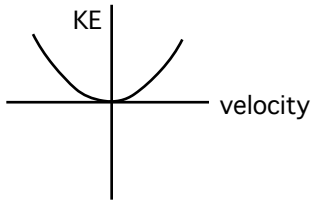
Part 4a: KE and PE verses velocity

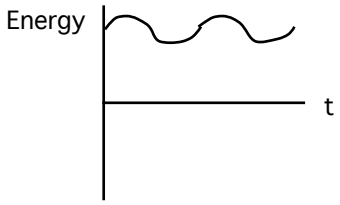
7. The graph of KE verses velocity looks like the following graph. What is the mathematical expression that describes this graph?



8. Sketch and interpret the graph of (Gravitational) Potential Energy verses velocity.

Part 5: Total Energy of Mass verses time

9. Total Energy was first defined as KE + PE, (where KE = 1/2 mv^2 and PE = mgh) That graph looked like the following graph. Why does it appear that energy is not conserved?



10. Sketch the graph of Energy verses time, taking into account other forms of energy. Explain your graph.

11. We ignored the energy dissipated by air drag and the rise in internal energy of the spring. Did that mess up the results at all?