Oscillations

These are the problems that you and a team of other 2-3 students will be asked to solve during the recitation session next week. Your team can do better if you think about the approach and explanation for these problems BEFORE coming to class.

1. A vertically Hanging Spring Loaded with a Mass: The upper end of a massless spring of constant $k$ is attached to a fixed point. A box of mass $m$ is hung at the lower end of the spring. Initially, you hold this box at rest with your hand at a vertical position so that the spring is neither stretched nor compressed. For all the processes described below, the spring remains completely elastic. Please set up a vertical y-axis pointing up with this resting position as the origin.

   a) If you lower your hand slowly, the box will follow your hand initially. At some vertical position, the box will stop and no longer follow your hand. This is the equilibrium position. Find this equilibrium position.

   b) Now, again, you hold this box at that initial resting position so that the spring is neither stretched nor compressed. This time, instead of lowering the box slowly as in (a), you are going to release the box at time $t = 0$ and let it drop “freely”. Find the time taken by the box to return to your hand.

2. Not so simple pendulum: A thin uniform hoop of mass $M$ and radius $R$ is hung on a thin horizontal peg and set to oscillate at small amplitude. Find the period of oscillation of the hoop.

   **Approach:** Under this tab, list the steps taken by your team for finding each solution. You answer here the questions WHAT? and HOW?

   **Approach 1.**
Approach 2.

**Explanation:** Under this tab, explain why your team has chosen those approaches. You answer here the questions WHY? and WHEN?

*Explanation 1.*

*Explanation 2.*