Physics 124 Prelab 4 Week of Feb 18 2019– Simple Harmonic Motion

Purpose: Use the principles of Simple Harmonic Motion to find the spring constant, \( k \), using two methods.

**METHOD 1**
When no mass is hung from the spring with spring constant \( k \), it extends a distance \( x \). When a mass \( M \) is hung from a spring it extends an additional distance \( \Delta x \) downwards from its original position.

a. Write down the sum of the forces on the mass \( M \) in the \( y \)-direction.

b. Solve for the spring constant \( k \) in terms of \( M \), \( \Delta x \) and any other constants you need to introduce. What are the units of \( k \)?

**METHOD 2**
A mass \( M \) is hung from the same spring and given a small pull downwards and let go. The spring-mass system starts oscillating with a period of \( T \).

a. What is the relationship between the angular frequency \( \omega \) and the time period \( T \)?

b. What is the relationship between the angular frequency \( \omega \) and the mass \( M \) and the spring constant \( k \)?

c. Use the above two equations to express the spring constant \( k \) in terms of the mass \( M \) and time period \( T \).