Lab 1

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1 Introduction and Background

When a spring is pulled, the force it generates is proportional to its displacement from its resting position. The system is described by the following equation:

$$f = kx \tag{1}$$

A consequence of this equation is that it is possible to predict how much force (f) is being applied for a given displacement (x) and spring force constant (k).

Furthermore, if the system is vertical and a known mass is placed on the end, it is possible to calculate the spring's force constant k by observing the change in the mass's displacement. The equation for determining the magnitude of the force that the mass exerts on the spring (when the system is at rest) is the following:

$$f = ma \tag{2}$$

Since we are on Earth, a can be assumed to be $9.81m/s^2$. Equation 2 is needed to determine the value of f in Equation 1 when the system is vertical and stationary.

A more interesting situation arises when the system is no longer stationary. If the mass starts moving up and down, its position follows the following path:

$$x(t) = Acos(\omega t + \phi) \tag{3}$$

where A is the amplitude of the oscillation (in meters), ω is the angular frequency of the oscillation (in rad/sec), and ϕ is the phase offset of the system (in radians).

2 Procedure

3 Results

4 Discussion