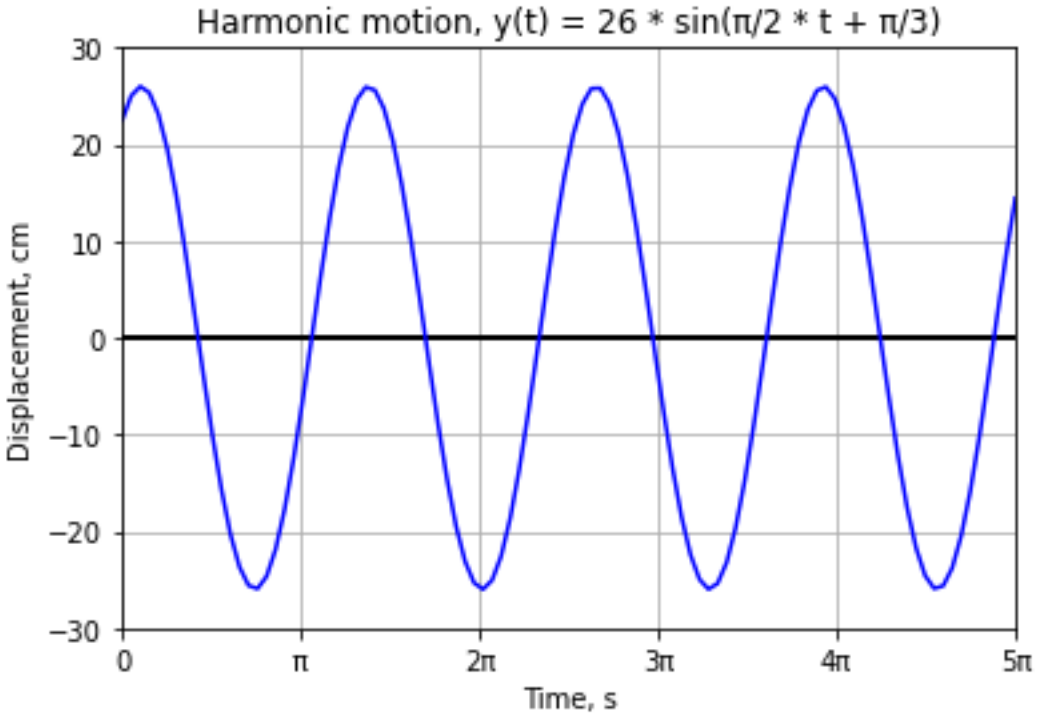
ENGR/PHYS 216 – Spring 2023
HW Assignment 11: Harmonic Motion

1. Given the equation and graph shown below, what is the amplitude (A), period (T), angular frequency (ω), and phase difference (ϕ)? If this graph shows the displacement of a $18\ kg$ mass connected to a spring, what is the kinetic energy at the equilibrium point?



2. A spring hangs from the ceiling. A mass of $0.25\ kg$ is attached to the end of the spring which then oscillates with simple harmonic motion. If the period of oscillation is measured to be $0.50\ sec$, what is the spring constant?

3. The blade of an electric shaver moves back and forth with simple harmonic motion over a total distance of $2.2\ mm$ and frequency $65\ Hz$. What is (a) the amplitude, (b) the maximum speed of the blade, and (c) the magnitude of the maximum acceleration of the blade?

4. A simple pendulum hangs in equilibrium. A frustrated student walks up to it and kicks the bob so that it swings with a period of $3.8\ seconds$ and has a maximum velocity of $0.65\ m/s$. What is the length of the pendulum? What is the maximum displacement of the bob (in degrees)?

5. A mass of $28.0\ g$ moves with simple harmonic motion. It has "springiness" of $1.40\ N/m$ and friction causes it to slow down with a damping coefficient of $252\ g/s$. Is the system overdamped or underdamped? What would the damping coefficient need to be for the system to be critically damped?