Name: _____

Class: _____

Due Date: _____

Physics Topic 28B – Simple Harmonic Motion with Calculus

Answer the following questions. The solutions to this worksheet can be found on the YouTube channel Go Physics Go.

1. C: Math review: Describe the significance of the variables A, B, C, and D in the equation $y = A\sin(Bx + C) + D$.

2. E: An object is undergoing simple harmonic motion with a period of 0.255 s, a maximum displacement of 5.28 cm, and a phase angle of $\frac{\pi}{4}$.

   a. Determine the displacement of the object after 1.25 s.

   b. Determine the velocity of the object after 2.50 s.

   c. Determine the maximum speed of the object.

3. C: Derive the equations of motion, energy, and speed for simple harmonic motion.

4. E: A mass of 0.765 kg undergoes simple harmonic motion with a maximum displacement of 0.232 m and a frequency of 0.652 Hz.

   a. Determine the period of the motion.

   b. Determine the total energy.

   c. Determine the potential energy of the mass when it is 0.100 m from its equilibrium position.

   d. Determine the kinetic energy of the mass when it is 0.100 m from its equilibrium position.

   e. Determine the speed of the mass when it is 0.100 m from its equilibrium position.

   f. Determine the maximum speed of the mass.

Optional for math lovers

The small angle approximation ($\theta < 10°$) for the period of a pendulum is

$$T = 2\pi\sqrt{\frac{l}{g}}$$

The exact solution for any angle is given from the video below:

Exact Solution of the Nonlinear Pendulum
Flammable Maths
https://www.youtube.com/watch?v=efvT2iUSjaA

Watch and take notes from the video.