**9. Periodic Motion homework problems**

Name and date submitted (3 pts):

Create space in the Word document below, and write or type your answers. Turn in your completed work as an email attachment. YOU MUST SHOW ALL YOUR WORK to get credit.

 (7 questions; 100 points)

Equations: F = -*k*∆x restoring force of springs, Hooke’s Law

 T = $\frac{1}{f}$ ; *f* = $\frac{1}{T}$ period & frequency

 T = 2π$\sqrt{\frac{m}{k}}$ spring-mass systems

 T = 2π$\sqrt{\frac{l}{g}}$ pendulum motion

 λ*f* = ν wavelength x frequency = velocity

1. The graph illustrates the displacement of a guitar string as a function of time as it is played on a single note. What is its
2. Amplitude
3. Period
4. Frequency
5. A 2.40 kg ball is attached to an unknown spring and allowed to oscillate. The graph depicts the ball’s position x as a function of time t. For this motion, what are
6. The period
7. The frequency
8. The amplitude
9. What is the force constant of the spring?



1. Four passengers with a combined mass of 250 kg compress the springs of a car with worn-out shock absorbers by 4.00 cm when they enter it. Model the car and passengers as a single body on a single ideal spring. If the loaded car has a period of vibration of 1.08 s, what is the period of vibration of the empty car?
2. A science museum has asked you to design a simple pendulum that will make 25.0 complete swings (one side to the other) in 85.0 s. What length should you specify for this pendulum?
3. A simple pendulum in a science museum entry hall is 3.50 m long, has a 1.25 kg bob at its lower end, and swings with an amplitude of 11.0°. How much time does the pendulum take to swing from its extreme right side to its extreme left side?
4. In the laboratory, a student studies a pendulum by graphing the angle θ that the string makes with the vertical as a function of time *t*, obtaining the graph shown below.
5. What are the period, frequency, and amplitude of the pendulum’s motion?
6. How long is the pendulum?
7. Is it possible to determine the mass of the bob?



1. The lost Martian: A Martian who frequently gets lost in the solar system keeps a ball on a string so that he can always figure out what planet he happens to be on. On Mars, where the acceleration due to gravity is gmars = 0.38gearth, the ball oscillates with a period of 1.5 s when it is swung like a pendulum bob. During one journey, the Martian finds himself on a planet where the ball oscillates with a period of 0.92 s. What is the acceleration of gravity on this planet?

