

RECITATION HANDOUT #14: Oscillations

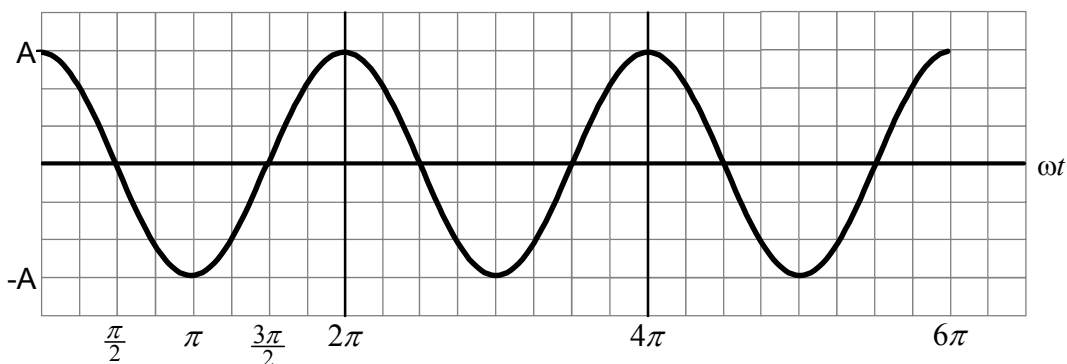
Use the following website to help you with these questions:

http://www.courses.vcu.edu/PHYS-jms/PHYS207/shm/spring_test.htm

Another useful site is: http://webphysics.davidson.edu/physlet_resources/bu_semester1/index.html

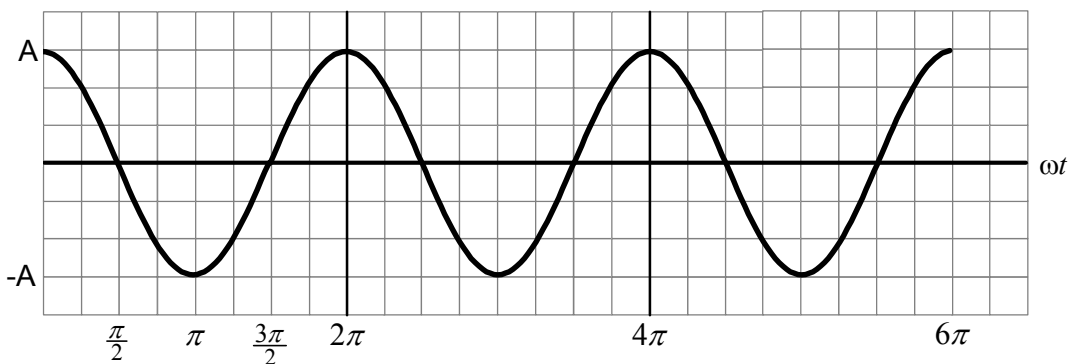
The graph below shows the position as a function of ωt for a mass m on a spring with spring constant k . It has been pulled away from its equilibrium position by a distance A and released at time $t = 0$.

1. Draw and label on the graph the **velocity** and **acceleration graphs** as a function of time. Draw the graphs such that their maximum values are three divisions, just as for the position graph. Write the indicated information below the graph.

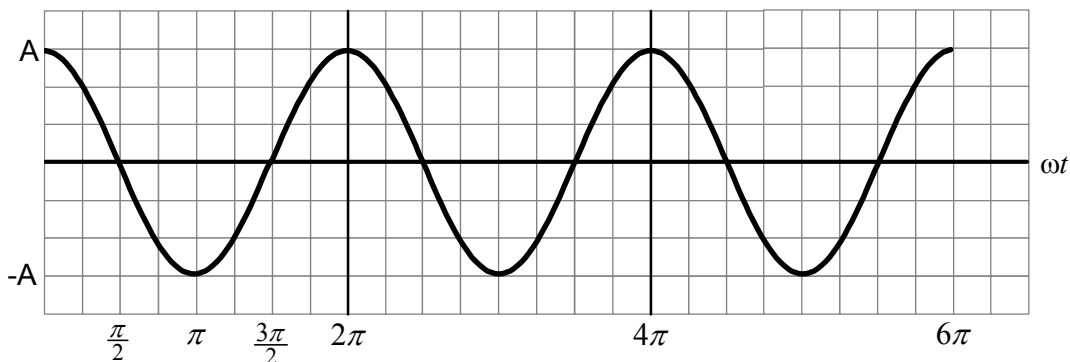


$x(t) =$ _____ Maximum $x =$ _____
 $v(t) =$ _____ Maximum $v =$ _____
 $a(t) =$ _____ Maximum $a =$ _____

2. The position graph for the same mass-spring system is shown below. Draw the position graph for an equivalent mass-spring system that is **pulled a smaller distance** from the equilibrium position before releasing.



3. The position graph for the same mass-spring system is shown below. Draw the position graph for a mass m on a spring with **spring constant $4k$** . Assume that the maximum amplitude remains unchanged. Hint: Calculate the **new ω value**. What is the formula for ω ?



4. A mass moving on a spring is at the **equilibrium position**. State if the quantities below are at their minimum (i.e., zero) or maximum values.

Velocity: _____

Acceleration: _____

Kinetic Energy: _____

Potential Energy: _____

5. A mass moving on a spring is at a “turnaround point” at the **top position** of its motion. State if the quantities below are at their minimum (i.e., zero) or maximum values.

Velocity: _____

Acceleration: _____

Kinetic Energy: _____

Potential Energy: _____

6. The **displacement** of an oscillating mass is given by: $x = 10 \sin(2t + \pi)$ m . Find the **initial velocity** of the mass at $t = 0$.

7. The **velocity** of an oscillating mass is given by: $v = 2 \cos\left(2t + \frac{\pi}{2}\right)$ m/s . Find the initial **acceleration** of the mass at $t = 0$.

