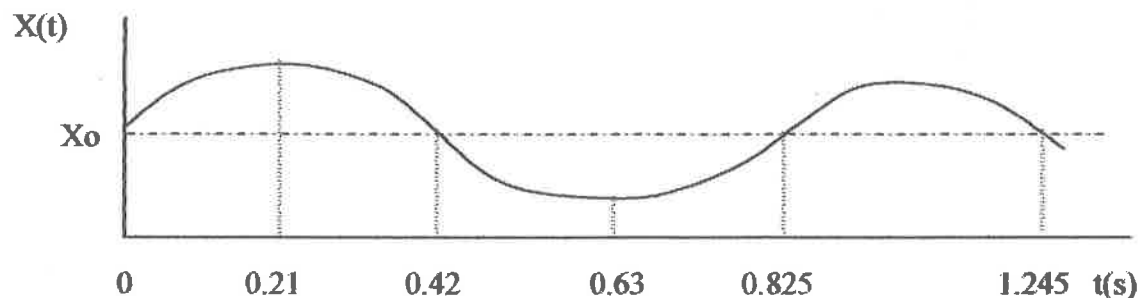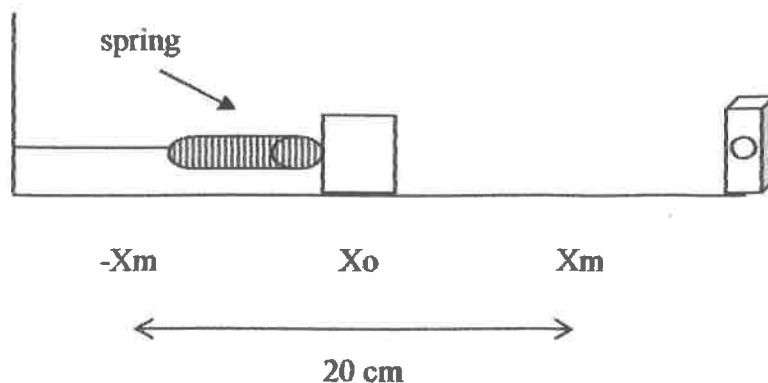# Linear Oscillator

A motion detector is placed next to a linear oscillator with a mass of 500 grams and then set into motion. The position time graph is show below the oscillator.

spring

-Xm   Xo   Xm

20 cm

X(t)

Xo

0   0.21   0.42   0.63   0.825   1.245   t(s)

5. $.825 = 2\pi\sqrt{\frac{.5}{k}}$

1. Find the period of the linear oscillator $.825 sec$
2. Find the frequency of the linear oscillator $1.212 Hz$
3. Find the angular frequency of the linear oscillator $7.62 m/s$
4. Find the amplitude of the linear oscillator $.1m$
5. Find the spring constant of the spring in the linear oscillator $29 n/m$
6. Write the position function of the linear oscillator $x(t) = .1 cos(7.12t - \pi/2)$
7. Write the velocity function of the linear oscillator $v(t) = -.762 sin(7.12t - \pi/2)$
8. Write the acceleration function of the linear oscillator $a(t) = -5.8 cos(7.62t - \pi/2)$
9. What is its maximum velocity? $.712 m/s$
10. What is its maximum acceleration? $5.8 m/s^2$

The 500 gram mass is now replaced by an unknown mass and the motion detector shows the following position vs. time graph.

X(t)

Xo

0   0.138   0.275   0.413   0.55   0.83   t(s)
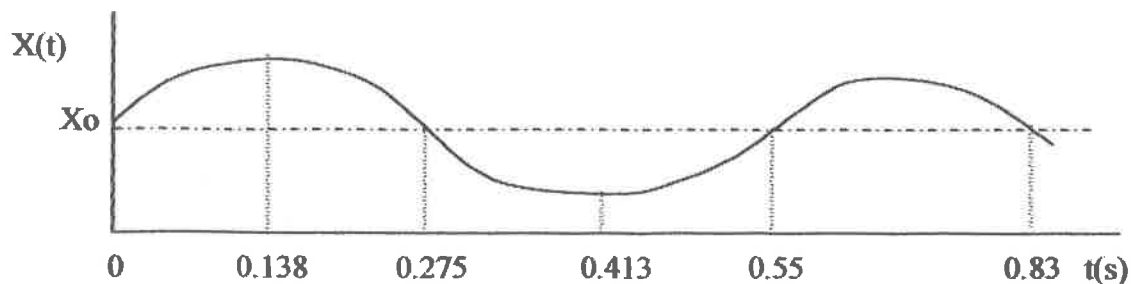
11. Find the value of this unknown mass. $.55 = 2\pi\sqrt{\frac{m}{29}}$

$$m = .222 kg$$