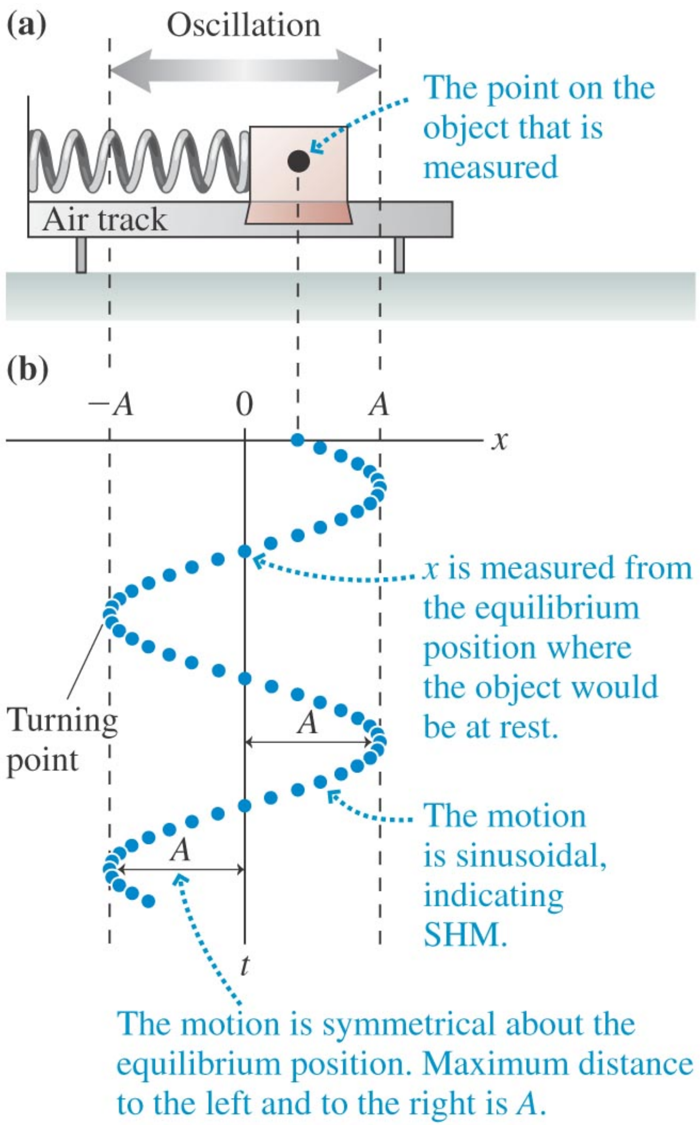
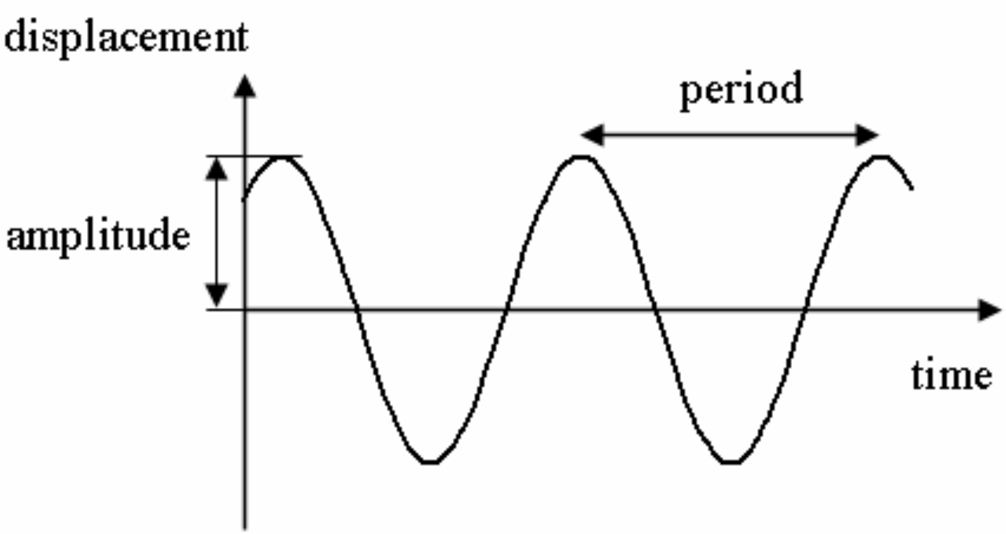
SIMPLE HARMONIC MOTION

Simple Harmonic Motion



Amplitude (A): An objects maximum displacement from its equilibrium position.

include picture below



Simple Harmonic Motion

If the object is released from from rest at time t=0, we can model the motion with the cosine function

$$x(t) = A\cos\omega t$$

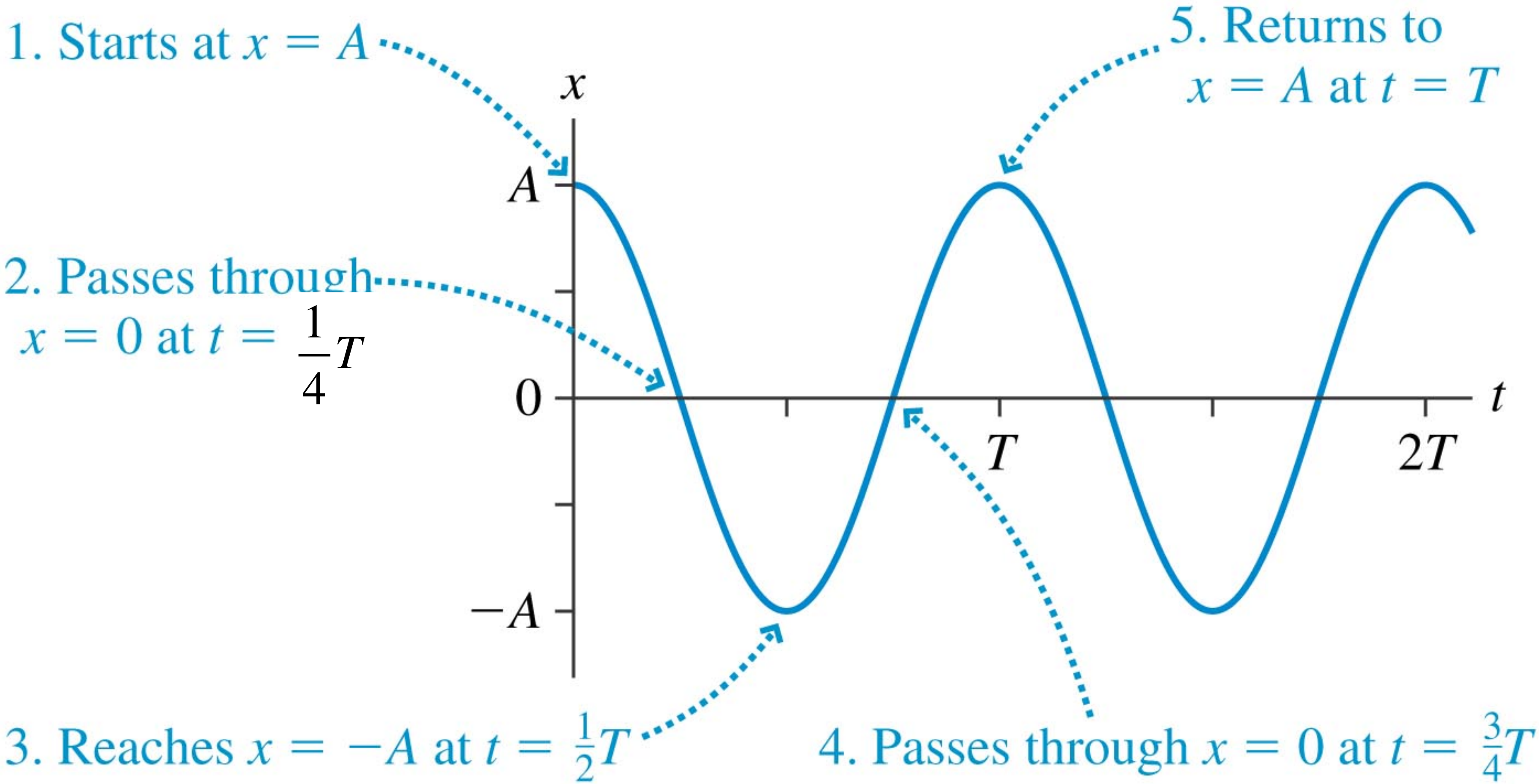
Cosine is a sinusoidal function.

$$\omega = 2\pi f$$

ω is greek letter omega.

ω is called the angular frequency

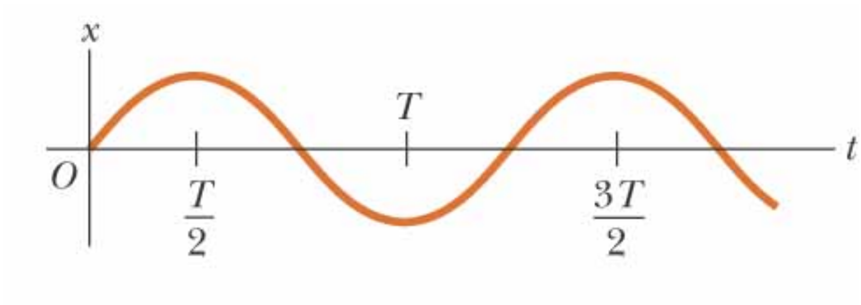
Calculator must be in degrees



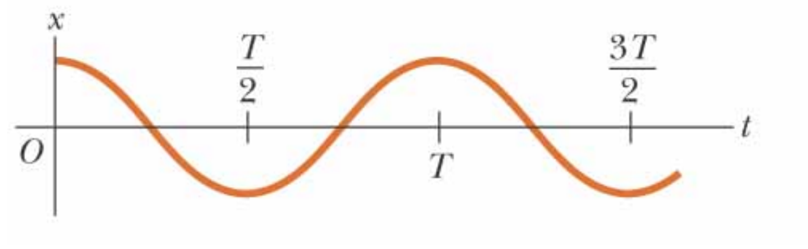
$$x(t) = A\cos\left(\frac{2\pi}{T}t\right)$$

since $f = \frac{1}{T}$ then $\omega = \frac{2\pi}{T}$

Sine vs. Cosine Function



Sine function



Cosine function

$$x(t) = A\sin\left(\frac{2\pi}{T}t\right)$$

$$x(t) = A\cos\left(\frac{2\pi}{T}t\right)$$

$$x_{\max} = A$$

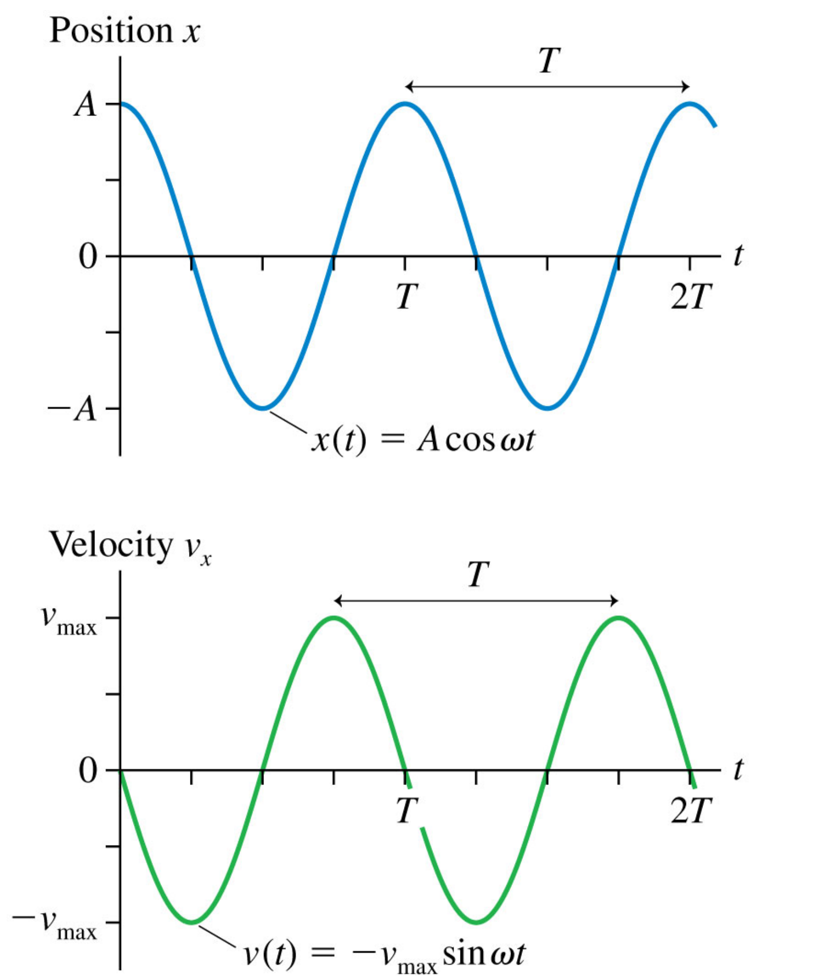
$$x = A\cos(\omega t)$$

$$v_x = -A\omega\sin(\omega t)$$

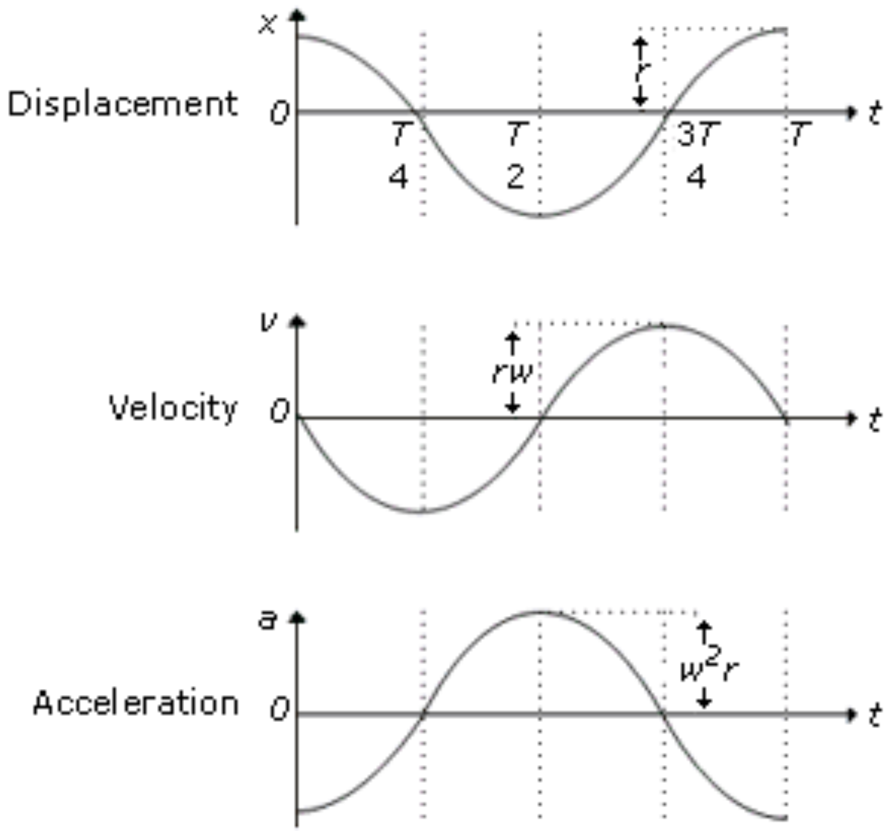
The ***maximum speed*** is

v_{max}=Aω

$$v_x(t) = -v_{max}\sin(\omega t)$$



Acceleration



$$x(t) = A\cos\left(\frac{2\pi}{T}t\right)$$

$$v(t) = -\omega A\cos(\omega t)$$

$$a(t) = -\omega^2 A\cos(\omega t)$$

$$a_{\max} = \omega^2 A$$

$$a(t) = -a_{\max}\cos(\omega t)$$