Answer Question #65632 – Physics – Mechanics – Relativity

A simple harmonic motion is represented by $x(t) = a\cos wt$ Obtain expressions for velocity and acceleration of the oscillator. Also, plot the time variation of displacement, velocity and acceleration of the oscillator.

Solution. Consider the equation $x(t) = a\cos wt$, where a is the amplitude of the oscillation (maximum displacement), w – the angular frequency, t – time.

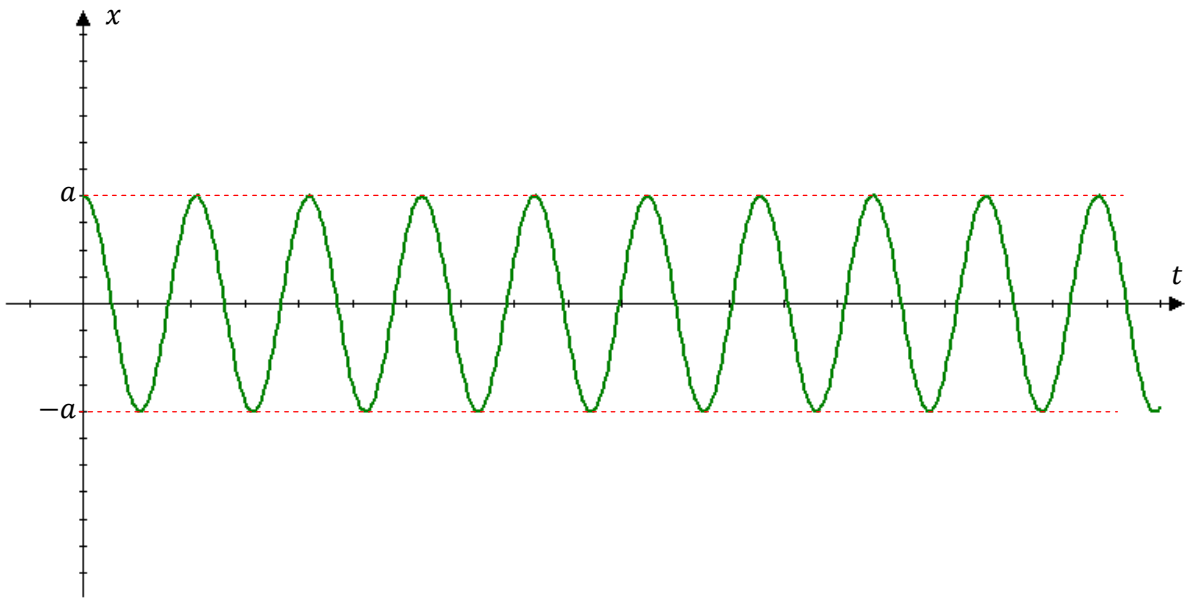
The velocity of the object as a function of time is given by

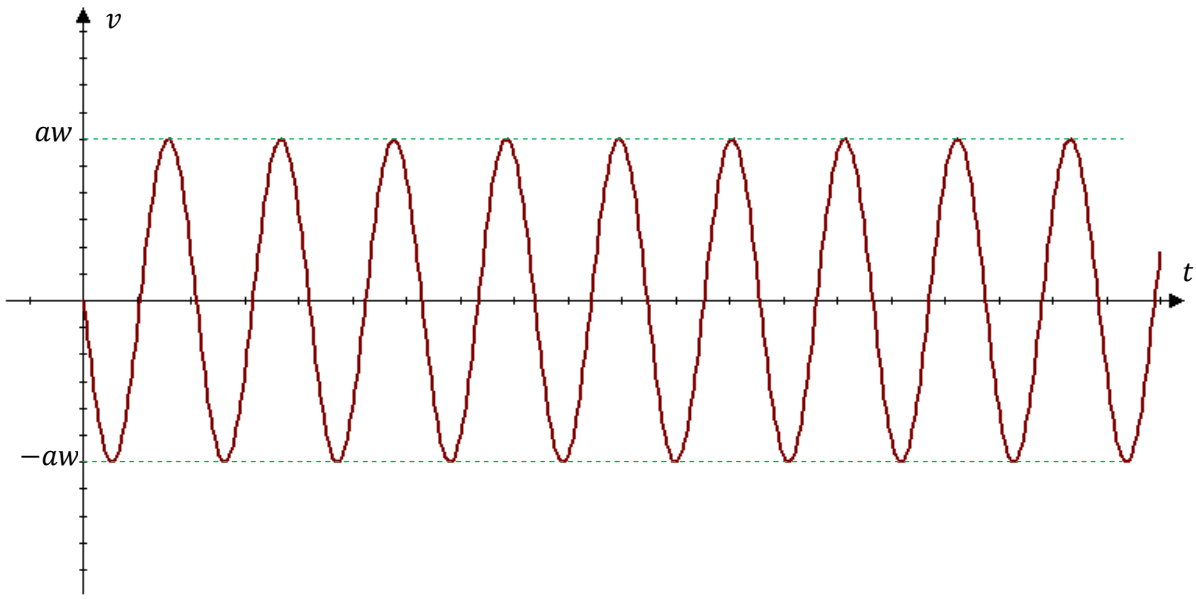
$$v(t) = \frac{dx(t)}{dt} = a(-\sin wt)w = -aw\sin wt.$$

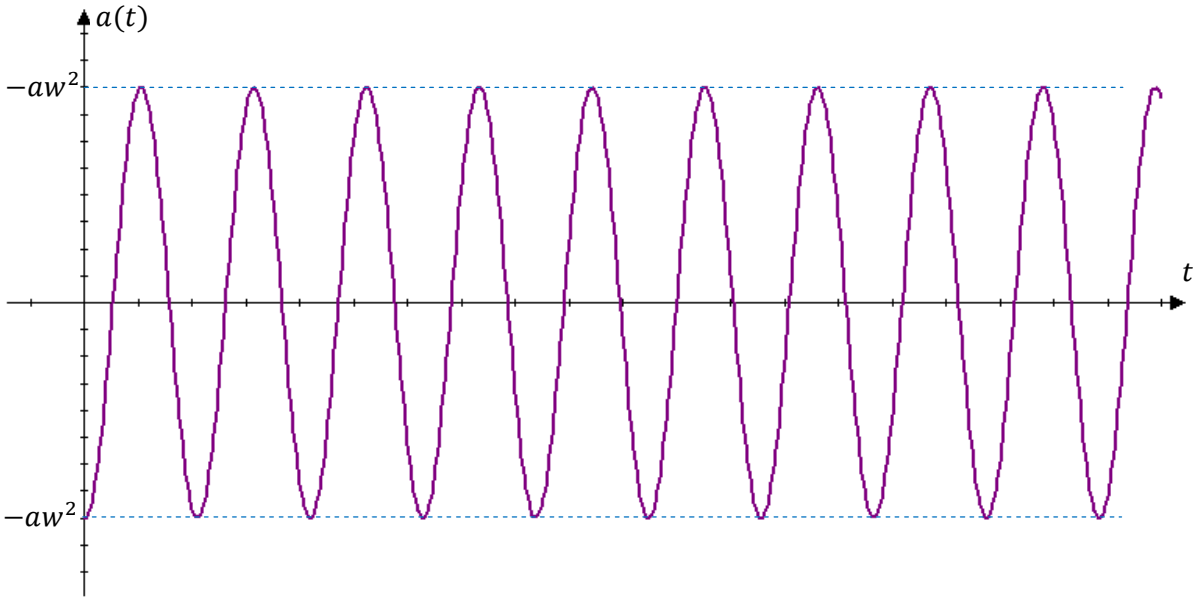
and the acceleration is given by

$$a(t) = \frac{dv(t)}{dt} = -aw(\cos wt)w = -aw^2\cos wt.$$

Plot the time variation of displacement, velocity and acceleration of the oscillator.







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