

# Solving Differential Equations representing Simple Harmonic Motion

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July 20, 2015

Consider  $m$  be the mass of object,  $k$  be spring constant,  $x$  be a displacement from equilibrium state of a spring and  $t$  is time.

Therefore, the given differential equation of Simple Harmonic Motion is

$$\frac{d^2}{dt^2}x + \frac{kx(t)}{m} = 0.$$

Solving the above differential equation, we get,

$$x = K_2 \cos\left(\frac{\sqrt{k}t}{\sqrt{m}}\right) + K_1 \sin\left(\frac{\sqrt{k}t}{\sqrt{m}}\right)$$

When  $m = 1$ ,  $k = 1$ , then the graph is

