Mass on a Spring

Here we have several things going on:

1. We want the motion of the mass oscillating along the y axis

2. We want to simultaneously generate the curve in plane

3. We want a horizontal line connecting the point with the curve

We want the trajectory over 3 periods so t wil vary from 0 to 6π = .

So set the horizontal axis to go from -1 to 6π . The reason we start at -1 is so the mass moving up and down the y axis can be seen clearly. Set the vertical axis from -1.1 to 1.1

Since the curve describing the motion is f(t) = cos(t)

We will use an increment $\frac{\pi}{48}$ of so we'll need frames 288 frames -- $\frac{\pi}{48}\cdot 288 \rightarrow 6\cdot\pi$

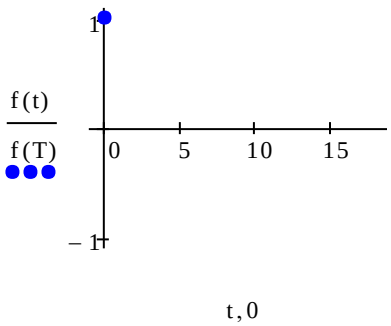
$t := 0, \frac{\pi}{48} .. \frac{\pi}{48}\cdot FRAME$ $T := \frac{\pi}{48}\cdot FRAME$ this will be used to locate the mass at a single point

Define $f(t) := \cos(t)$

On the vertical put f(t) and f(T).

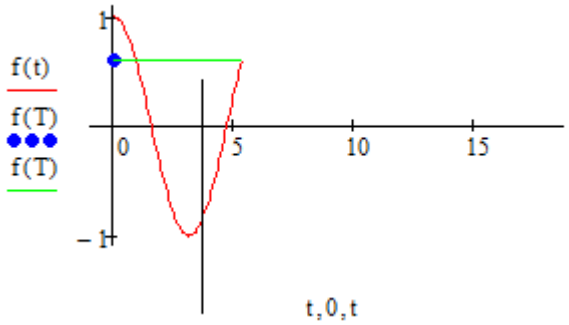
On the horizontal put t and 0. This will fix the x - coordinate to be 0 for the oscillating mass.

For Trace2 change lines to points and add a symbol



We still need a horizontal line to go from the mass to the curve. The y coordinate needs to be f(T) so put in another f(T) on the vertical but the horizontal component needs to go from 0 to t so put t on the horizontal

For Trace 3 change Line to solid. The graph below shows the situation is at t = $\frac{\pi}{48}\cdot 82$

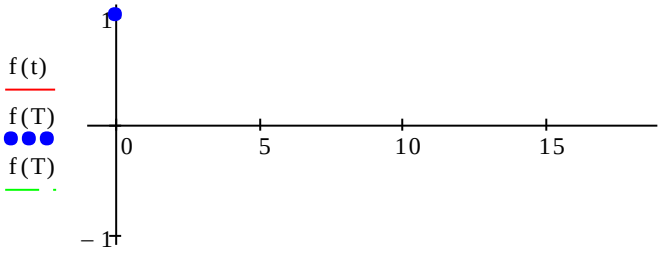


So Finally we have for our format:

$t := 0, \frac{\pi}{48} .. \frac{\pi}{48}\cdot FRAME$ $T := \frac{\pi}{48}\cdot FRAME$

$f(t) := \cos(t)$

$T \rightarrow 0$ $f(T) = 1$



Now animate with 288 frames -- I would probably use an animation speed of 10 frames/sec

This is the same format used for free fall the onlty difference is $f(t) := \frac{-1}{2}\cdot g\cdot t^2 + v_0\cdot t + h_0$ with the appropriate values of g, v_0 and h_0 filled in.

Another Method to include a horizontal from the point to the curve is using Show Markers and putting T on the horizontal and f(T) on the vertical or just f(T) on the vertical and nothing on the horizontal

$$f(t) := \cos(t)$$