Animating Graphs of the form y = f(x)

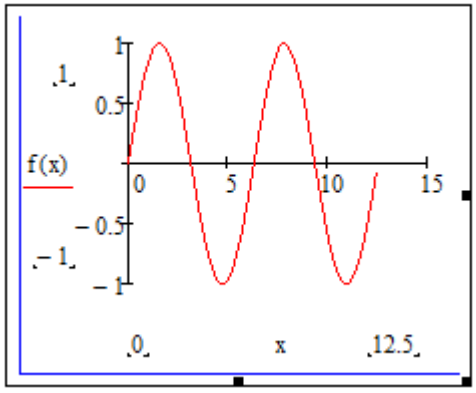
Suppose you want to animate the graph of f(x) =sin(x) over 2 periods $0 \le x \le 4\pi$.

1. We start by defining the range on x. Suppose we increment with a step size of 0.1

$x := 0, .1 .. 4\cdot\pi$ Note $4\cdot\pi = 12.566$

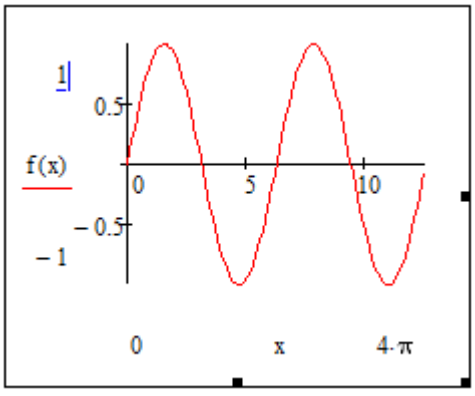
2. Graph as you normally would

$f(x) := \sin(x)$



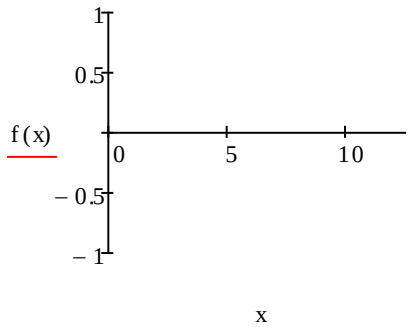

Before you animate fix the ranges in the x and y directions otherwise when you animate

Mathcad will adjust the domain and range at each Frame and it will look terrible and not be very instructive.



3. In order to animate we now simply adjust the definition of the range variable by changing 4π to Frame/10. The FRAME variables changes in whole number increments staring at 0. since we are using an increment of 0.1 we use $\frac{\text{FRAME}}{10}$ and since 4π = 12.6 we will use 126 frames

$x := 0, .1.. \frac{\text{FRAME}}{10}$ Note the graph disappears as f(x) is only defined when x = 0.

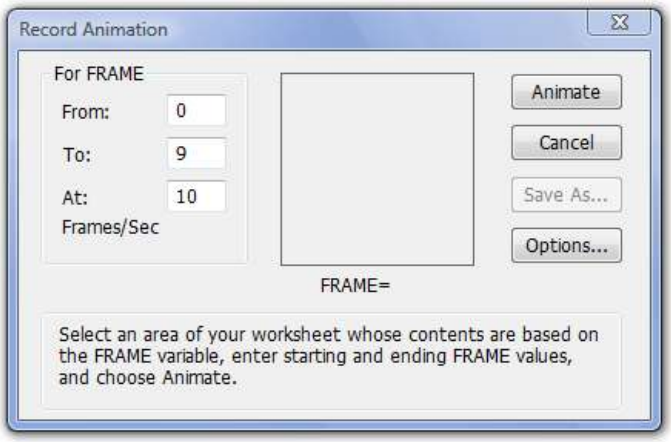



When FRAME takes on the value 1 the graph will plot f(x) for x = 0 and .1

When FRAME takes on the value 2 the graph will plot for x= 0, .1, and .2

and so on.

From the tools Menu choose ANIMATION and RECORD .The following window will appear:

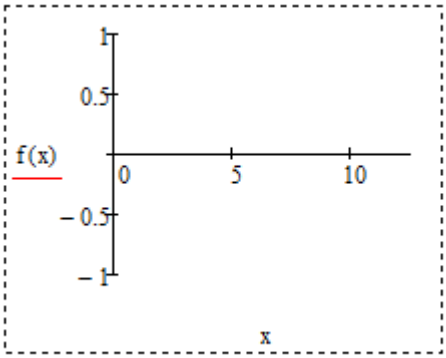


We are graphing from 0 to 4π at .1 sec intervals so in the FROM place put 0 and in the To place put 126.

In the At place decide how fast you want the animation to proceed. This varies from prblm to prblm--Here since we have 126 frames I would probably want to use 5 Frames/sec

so the entire animation will play in about 25 secs.

4. Highlight the graph you want to animate and click Animate on the Animation window.




5. A playback window will appear and you can view your animation before you save it.

That's it. See Animation 1

Be Careful Suppose we didn't fix the axes before starting. See Animation 2

Let's Refine our Work

Suppose you want the value of x and f(x) to be displayed and you want x in multiples of π.

Here we will use increments of $\frac{\pi}{48}$

Define

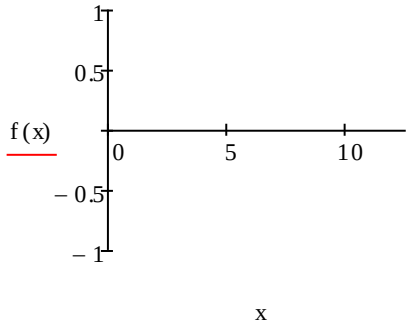
$x := 0, \frac{\pi}{48} .. \text{FRAME}\frac{\pi}{48}$ and $\underset{\wedge\wedge\wedge}{f}(x) := \sin(x)$

also define $X := \text{FRAME}\frac{\pi}{48}$ and $\underset{\wedge\wedge\wedge}{f}(X) := \sin(X)$

This will give us X and f(X) at just a single point. Above the graph type X then hit (ctrl -period) enter and f(X) (ctrl-period) enter. If you type X = and f(X) = you will get the decimal representation, by using (ctrl-period) enter you get the symbolic result. This time we will use 192 Frames as

$\frac{\pi}{48} \cdot 192 \rightarrow 4 \cdot \pi$ Here I'll set the animation speed to 10 Frames/Sec

$X \rightarrow 0$ $f(X) \rightarrow 0$



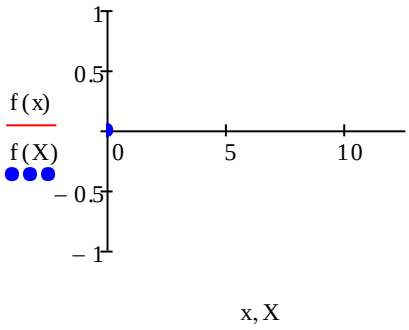

See Animation 3

Suppose Now we add the point on the graph. Put f(X) and X on the vertical and horizontal respectively.
Here I'm going to use f(X) = to show how = gives the decimal representation.

In the FORMAT Window We will change the format for Trace 2

1. Under Type change to points
2. Under Symbol select a symbol--I chose a closed circle
3. Now Animate again

$X \to 0$ $\quad f(X) = 0$



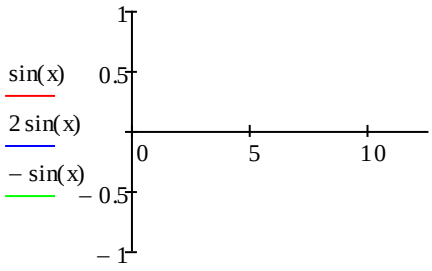

See Animation 4

If you look on the Trigonometry page of Calculus7.com you'll see how all the animations were developed. One difference is you'll notice instead of defining f(x) I just typed sin(x)
in the vertical place holder.

For Example to illustrate changing amplitudes the following is the set up for the graphs of
sin(x), 2sin(x), and -sin(x)

$x := 0.\frac{\pi}{48} .. \text{FRAME}\frac{\pi}{48}$ $X := \text{FRAME}\frac{\pi}{48}$

$X \rightarrow 0$




x, x, x