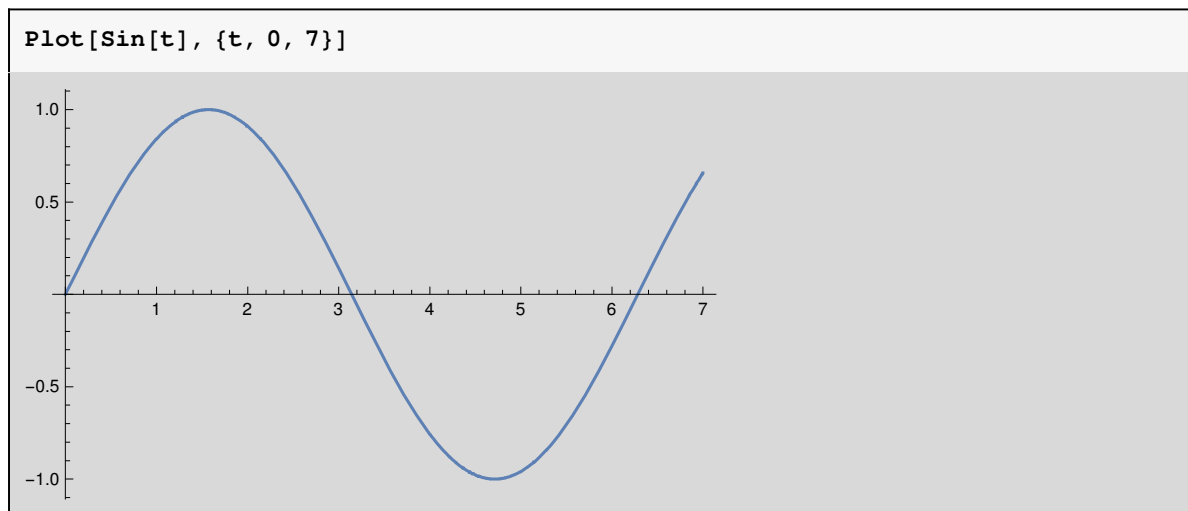

Graph and Sound of Sine Waves in *Mathematica*

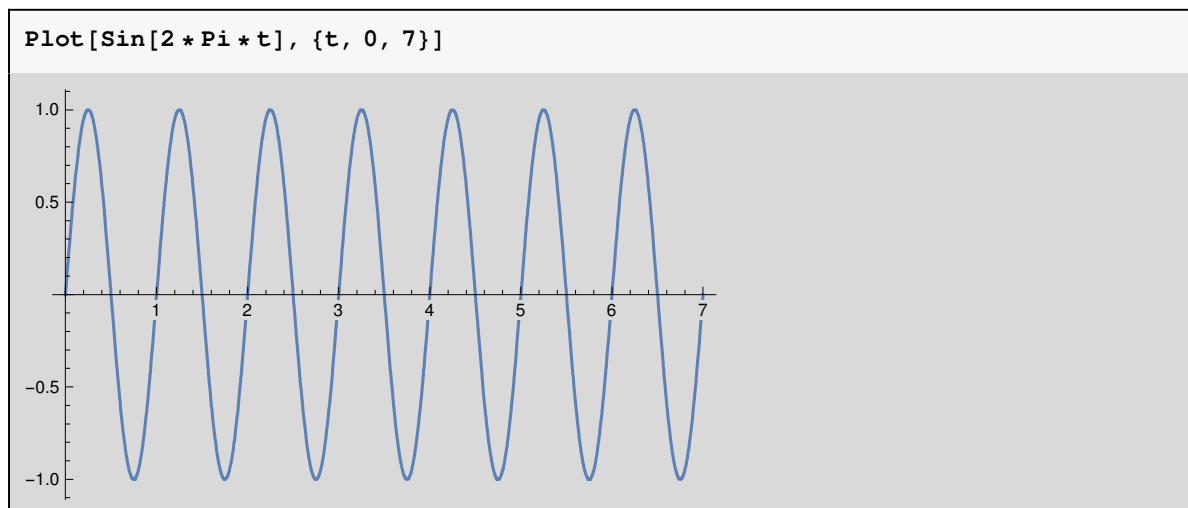
Author: José Luis Gómez-Muñoz <http://homepage.cem.itesm.mx/jose.luis.gomez/>

Plot and Play a Function

In order to graph the function sine of t radians, write the command `Plot[Sin[t],{t,0,7}]` and press [SHIFT]-[ENTER] at the same time:

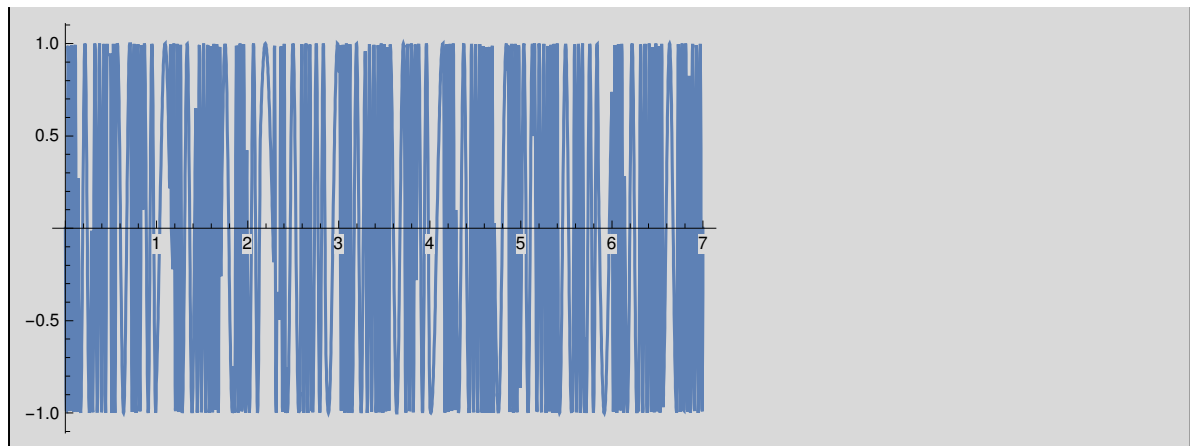


A simple modification is needed to graph sine of $2\pi t$:

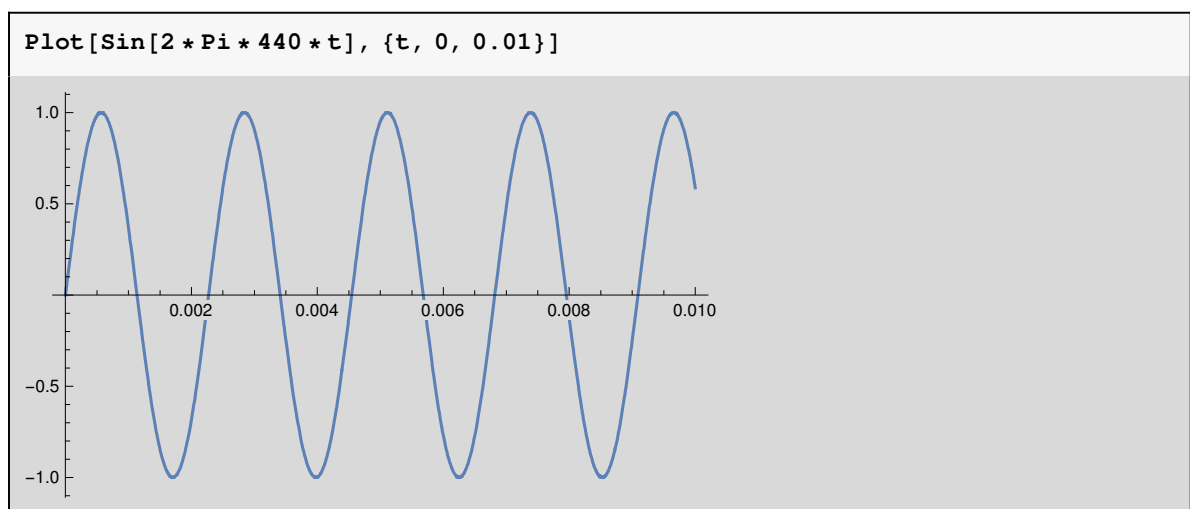



Next we try to graph sine of $2\pi(440)t$, however this function oscillates too many times in the interval from $t=0$ to $t=7$, therefore the graph is not useful:

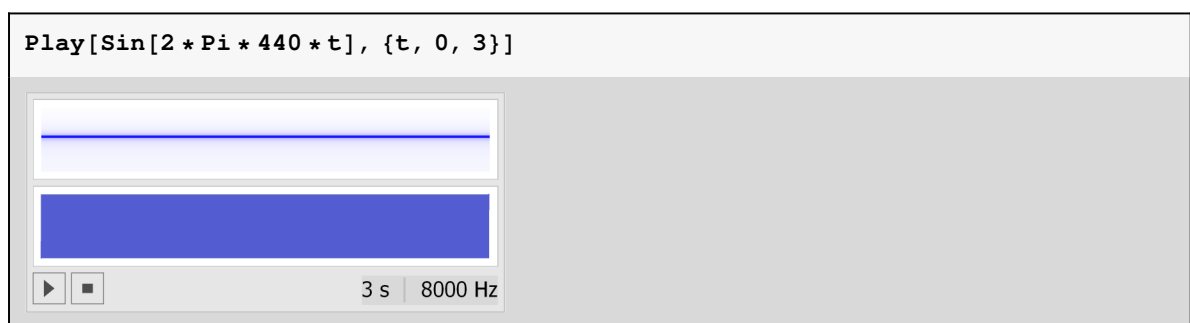
```
Plot[Sin[2 * Pi * 440 * t], {t, 0, 7}]
```



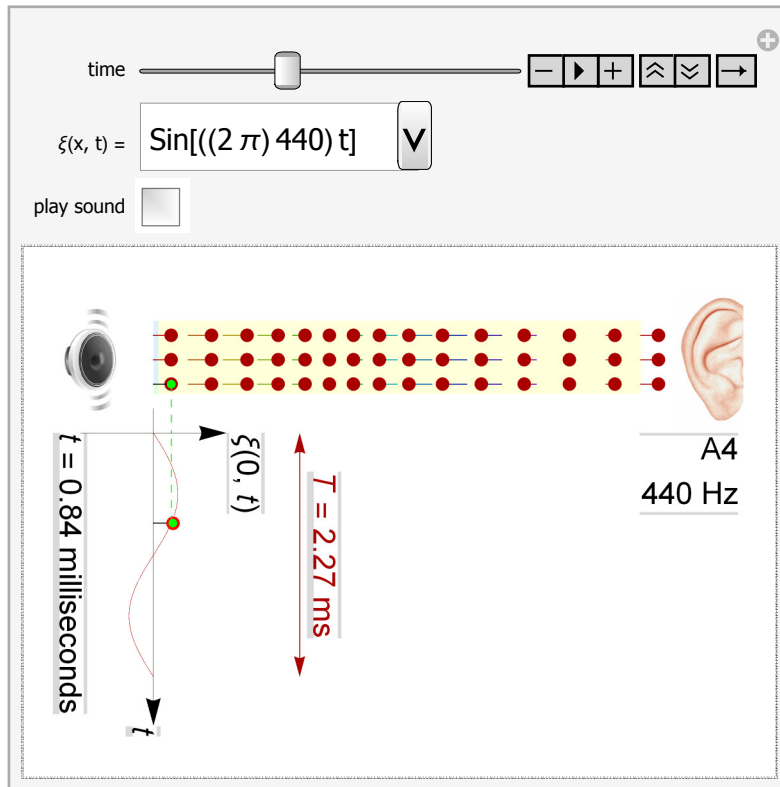
We better graph sine of $2\pi(440)t$ in the interval from $t=0$ to $t=0.01$:




In order to LISTEN TO the function sine of $2\pi(440)t$ during 3 seconds, write the command `Play[Sin[2*Pi*440*t], {t, 0, 3}]` and press [SHIFT]-[ENTER] at the same time (if you are reading this document in *Mathematica* or the *CDFPlayer*, press the button  in the result of the calculation):



Please **enable dynamic content** in *Mathematica* or the *CDFPlayer* in order to be able to interact with the following demonstration:



We can “Sound[...]” together different functions in order to have a song (if you are reading this document in *Mathematica* or the *CDFPlayer*, press the button  in the result of the calculation):

```
Sound[{
  Play[Sin[329.62 * 2 * Pi * t], {t, 0, 0.5}],
  Play[Sin[440 * 2 * Pi * t], {t, 0, 0.75}],
  Play[Sin[523.25 * 2 * Pi * t], {t, 0, 0.25}],
  Play[Sin[493.88 * 2 * Pi * t], {t, 0, 0.5}],
  Play[Sin[440 * 2 * Pi * t], {t, 0, 1}],
  Play[Sin[659.25 * 2 * Pi * t], {t, 0, 0.5}],
  Play[Sin[587.33 * 2 * Pi * t], {t, 0, 1.5}],
  Play[Sin[493.88 * 2 * Pi * t], {t, 0, 1.5}],
  Play[Sin[440 * 2 * Pi * t], {t, 0, 0.75}],
  Play[Sin[523.25 * 2 * Pi * t], {t, 0, 0.25}],
  Play[Sin[493.88 * 2 * Pi * t], {t, 0, 0.5}],
  Play[Sin[415.3 * 2 * Pi * t], {t, 0, 1}],
  Play[Sin[493.88 * 2 * Pi * t], {t, 0, 0.5}],
  Play[Sin[329.62 * 2 * Pi * t], {t, 0, 1.5}]
}]
```

We can “Export[...]” the song to a WAV file from *Mathematica*:

```

Export["mysong.wav",
Sound[{
  Play[Sin[329.62 * 2 * Pi * t], {t, 0, 0.5}],
  Play[Sin[440 * 2 * Pi * t], {t, 0, 0.75}],
  Play[Sin[523.25 * 2 * Pi * t], {t, 0, 0.25}],
  Play[Sin[493.88 * 2 * Pi * t], {t, 0, 0.5}],
  Play[Sin[440 * 2 * Pi * t], {t, 0, 1}],
  Play[Sin[659.25 * 2 * Pi * t], {t, 0, 0.5}],
  Play[Sin[587.33 * 2 * Pi * t], {t, 0, 1.5}],
  Play[Sin[493.88 * 2 * Pi * t], {t, 0, 1.5}],
  Play[Sin[440 * 2 * Pi * t], {t, 0, 0.75}],
  Play[Sin[523.25 * 2 * Pi * t], {t, 0, 0.25}],
  Play[Sin[493.88 * 2 * Pi * t], {t, 0, 0.5}],
  Play[Sin[415.3 * 2 * Pi * t], {t, 0, 1}],
  Play[Sin[493.88 * 2 * Pi * t], {t, 0, 0.5}],
  Play[Sin[329.62 * 2 * Pi * t], {t, 0, 1.5}]
}]
]

```

mysong.wav

The command "Directory[]" gives the directory where you can find your exported WAV file. It will **not** be the same directory as in this example; you must evaluate Directory[] in *Mathematica* in your computer in order to know the correct directory in your computer:

```
Directory[]
```

C:\Users\L00698076\Dropbox\SetDirectory

Exercise 1 "Mary had a Little Lamb"

Use the commands Sound[] and Play[], as shown before in this document, in order to produce the song "Mary had a Little Lamb"

Exercise 2 "Las Mañanitas"

Use the commands Sound[] and Play[], as shown before in this document, in order to produce the mexican song "Las Mañanitas"

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```
{$Version, DateString[]}
```

```
{10.0 for Microsoft Windows (64-bit) (June 29, 2014),
Sat 10 Jan 2015 18:54:34}
```