

It is important to know where on the hard disc this notebook is located. The command `NotebookDirectory[]` will tell us in which directory is our notebook.

```
In[1]:= NotebookDirectory[]
```

```
Out[1]= C:\Dropbox\Work\myweb\Courses\Math_pages\Math_430\
```

I find it useful to ask Mathematica for the name of this file. The command `NotebookFileName[]` will tell us in which directory is our notebook.

```
In[2]:= NotebookFileName[]
```

```
Out[2]= C:\Dropbox\Work\myweb\Courses\Math_pages\Math_430\How_to_create_animations.nb
```

Mathematica also uses the concept of **Working Directory**. The command `Directory[]` will tell us the current **Working Directory**.

```
In[3]:= Directory[]
```

```
Out[3]= C:\Users\Branko\OneDrive - Western Washington University\Documents
```

The concept of the **Working Directory** is important since when we use the command `Export[]`, Mathematica will place the exported file in the **Working Directory**.

Therefore we want to set **Working Directory** to the directory where we want to store exported files. The command `SetDirectory[]` will set our desired directory as the **Working Directory**. So, what I do next is specific to how I organize files. You should choose your own **Working Directory** to the desired directory of your choice. In the command below you should remove the comment out code (`*` `*`) and change the directory to what you want.

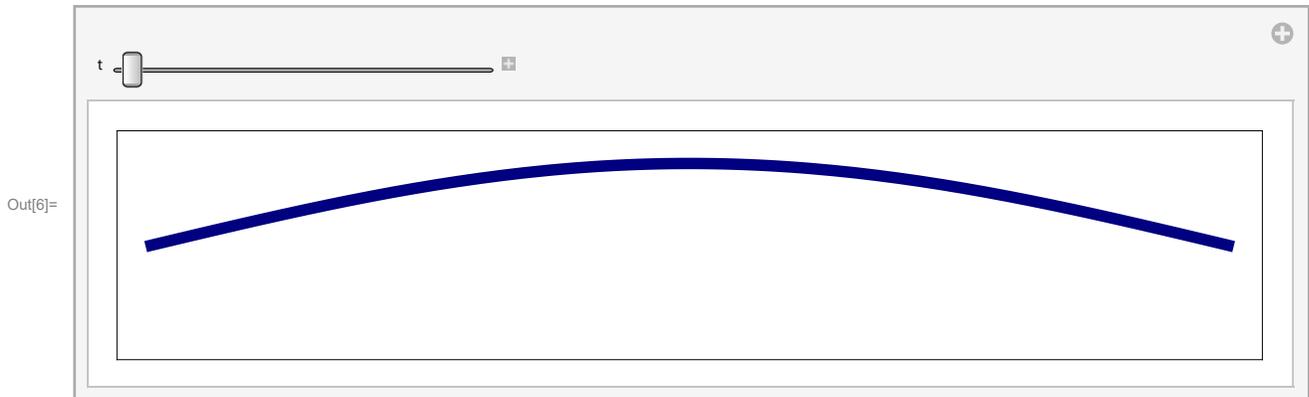
```
(* SetDirectory["C:\\Dropbox\\Work\\myweb\\Courses\\Math_pages\\Math_430\\" ] *)
```

Let us create an animation how a simple string oscillates. The function which describes the oscillations is

```
In[5]:= Clear[uu]; uu[x_, t_] = Cos[t] Sin[x]
```

```
Out[5]= Cos[t] Sin[x]
```

```
In[6]:= Manipulate[Plot[uu[x, t], {x, 0, Pi}, PlotStyle -> {{Thickness[0.01], RGBColor[0, 0, 0.5]}},
  PlotRange -> {{-0.1, Pi + 0.1}, {-1.4, 1.4}}, AspectRatio -> 1 / 5,
  Frame -> True, FrameTicks -> {{{}, {}}, {{}, {}}, Axes -> False,
  ImageSize -> 600], {t, 0, 2 Pi}, ControlPlacement -> Top]
```



To export an animation we need to create a list of many pictures at different times.

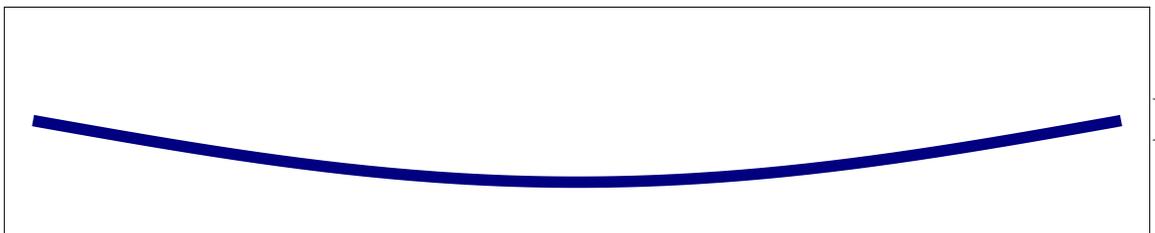
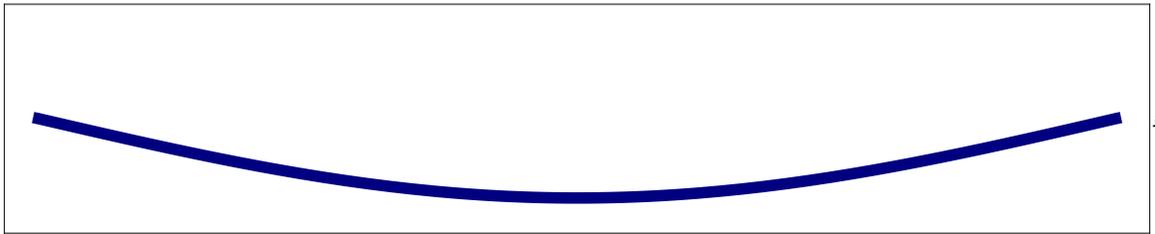
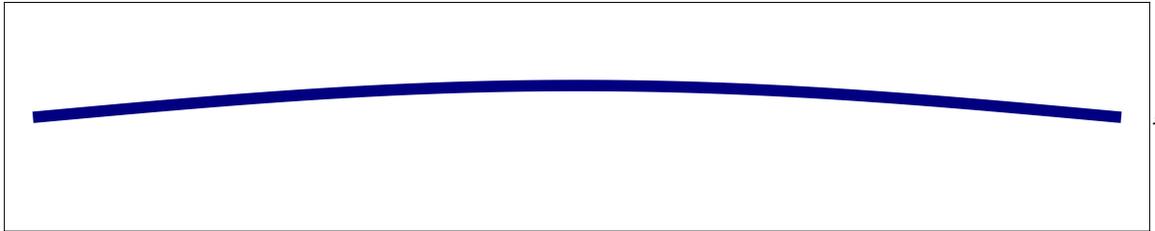
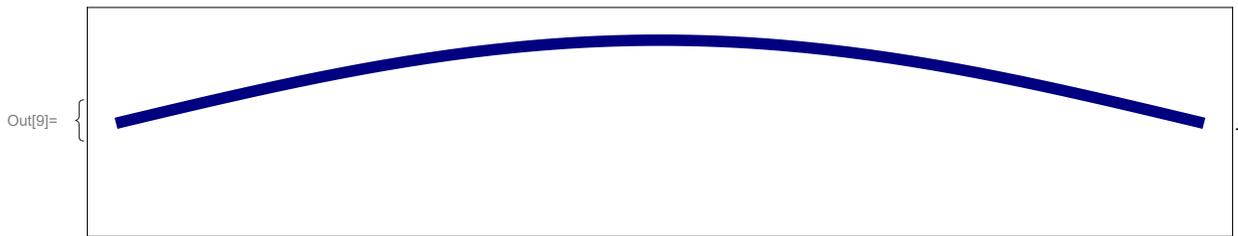
```
In[7]:= OscStr =
  Table[Plot[uu[x, t], {x, 0, Pi}, PlotStyle -> {{Thickness[0.01], RGBColor[0, 0, 0.5]}},
    PlotRange -> {{-0.1, Pi + 0.1}, {-1.4, 1.4}}, AspectRatio -> 1 / 5,
    Frame -> True, FrameTicks -> {{{}, {}}, {{}, {}}, Axes -> False,
    ImageSize -> 600], {t, 0, 2 Pi, N[Pi / 64]}];
```

```
In[8]:= Length[OscStr]
```

Out[8]= 129

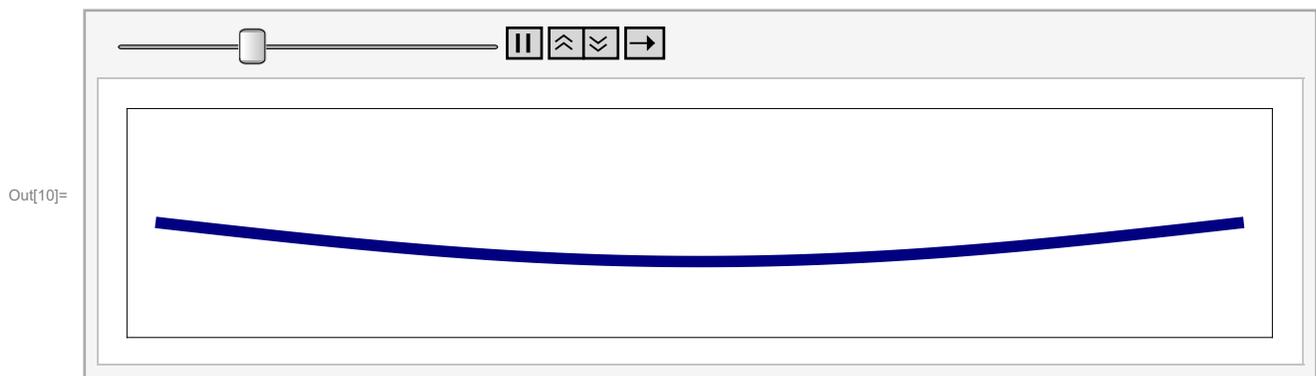
We have created a list of 129 pictures. Let us see few of them

```
In[9]:= {OscStr[[1]], OscStr[[25]], OscStr[[60]], OscStr[[80]]}
```



One can use the list of pictures to create an animation in Mathematica

```
In[10]:= ListAnimate[Show[#, ImageSize -> 600] & /@ OscStr, ControlPlacement -> Top]
```



Next I define the list of durations of each time frame that we want

```
In[11]:= dds = 0.1 & /@ Range[Length[OscStr]]; (* duration of each frame that we want*)
```

Verify where will the exported file be stored: (We set this earlier with `SetDirectory[]`)

```
In[12]:= Directory[]
```

```
Out[12]= C:\Users\Branko\OneDrive - Western Washington University\Documents
```

```
In[13]:= Export["OscStr.gif", OscStr, "AnimationRepetitions" → Infinity,  
"ImageSize" → 600, "DisplayDurations" → dds];
```

```
In[14]:= Export["OscStr.PNG", OscStr, "AnimationRepetitions" → Infinity,  
"ImageSize" → 600, "DisplayDurations" → dds];
```

The commands below are commented out since they are quite slow.

If you want to run them, remove the comment out code (`* *`)

```
(* Export["OscStr.mp4",OscStr] ; *)
```

```
(* Export["OscStr.mov",OscStr] ; *)
```

```
(* Export["OscStr.avi",OscStr] ; *)
```

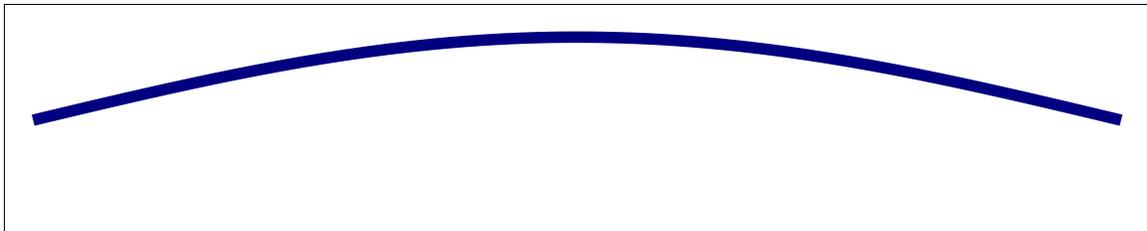
I use only gif and png animated files since they are easy to include in html and display on simple web-pages.

Unfortunately, I did not find a way of including any of these movie formats into a pdf file. In fact gif and png are easy to include, but pdf shows only the first frame not the animation.

Above I explained how to create and export animations in Mathematica. Much more often we need to export pictures. Like the first picture in our animation

```
In[18]:= OscStr[[1]]
```

```
Out[18]=
```



To export this picture as PNG file we use

```
In[19]:= Export["OscStrS1.PNG", OscStr[[1]], "ImageSize" → 600];
```