Plot tutorial in Mathematica

First start by clearing all definitions that might lead to confusing results. I use subscripted variables in nice notebooks like this, hence the subscript command here. Make sure to "evaluate" each of the cells as you go along by hitting shift-enter from within each cell, or choose an appropriate command under the "Evaluation" menu.
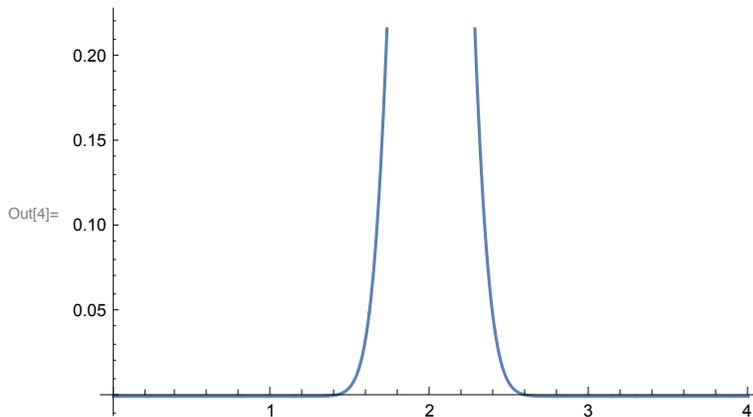
In[1]:= `Clear[Subscript];`

Now define some functions to plot. We'll just use simple equalities here. You can define more formal functions in *Mathematica*, but we don't need that functionality here.

In[2]:= $y_1 = \text{Exp}\left[-20\ (x-2)^2\right];$

$y_2 = \text{Sin}[3\ y_1];$
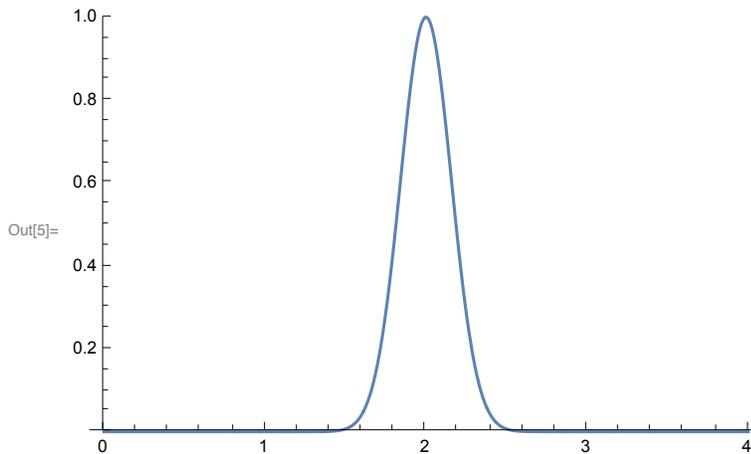
Here is the simplest plot command for one function. You need to specify the function, then the independent variable and its range as follows.
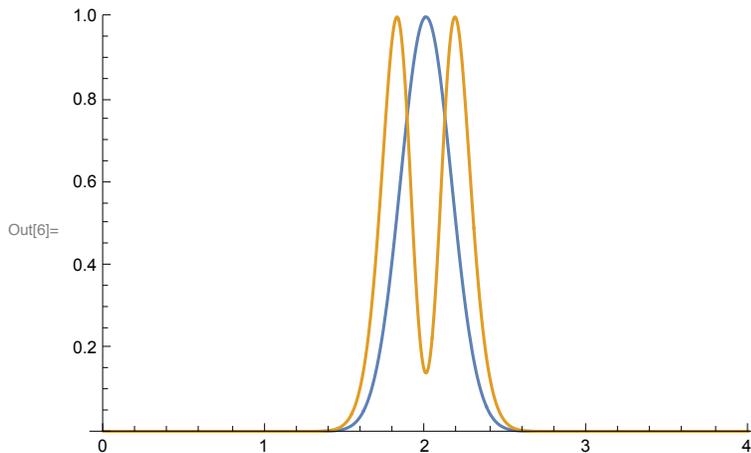
In[4]:= `Plot[y₁, {x, 0, 4}]`

Out[4]=

Mathematica sometimes makes crappy automatic choices, here with respect to the vertical scale. Control this manually using the PlotRange option. (Type the arrow as ->, minus-greater-than; *Mathematica* may or may not decide to automatically convert it into a single arrow character.)

In[5]:= `Plot[y₁, {x, 0, 4}, PlotRange -> {0, 1}]`

Out[5]=

Plot multiple functions using curly braces.

In[6]:= `Plot[{y₁, y₂}, {x, 0, 4}, PlotRange -> {0, 1}]`
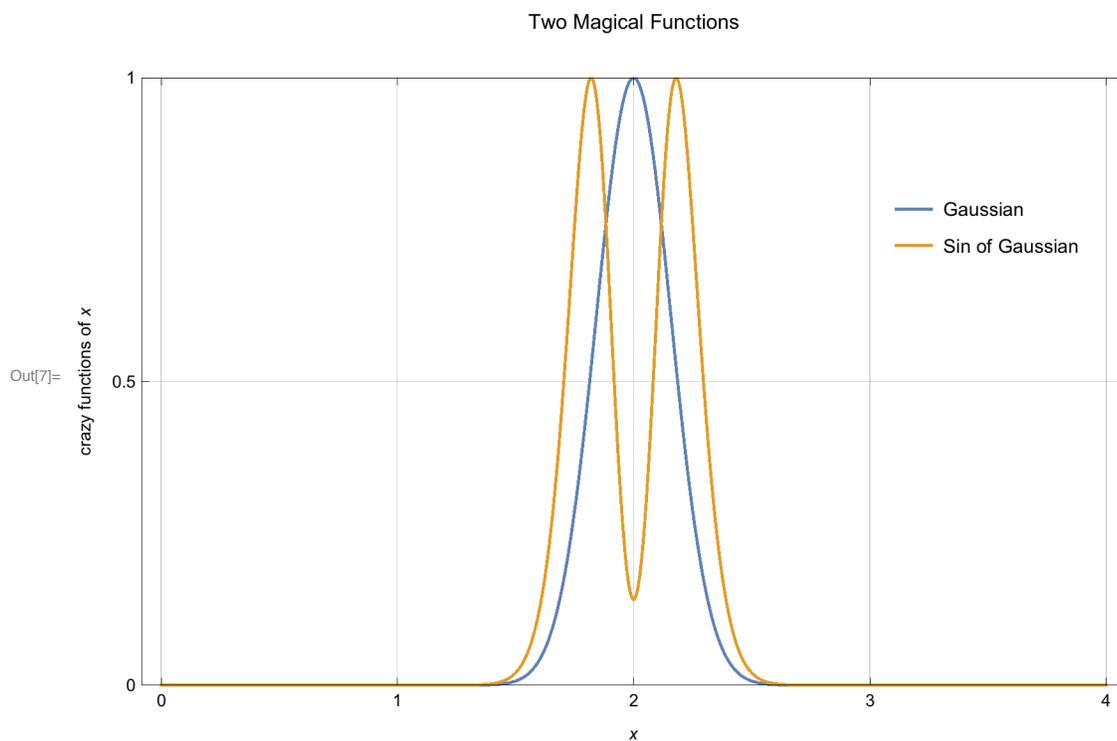
Out[6]=

Those plots are good for quick visualization of functions. However, you should strive for publication-quality plots. Here is the same plot, but with axis labels, a title, and a legend (note that you have to manually tweak the size and position of the legend until it looks good). Also, here we are manually setting the ticks on the plot, which is good to emphasize particular features of the functions. Play around with the various options to get a feel for them.

Unfortunately, *Mathematica*'s syntax and functionality seems to be growing more user-hostile over time. For example, the confusing FrameTicksStyle declaration prevents Mathematica from printing redundant labels on the top and right-hand sides of the graph. Grid lines must be repeated from the FrameTicks, because the Automatic setting chooses not to match the user-declared ticks, etc. Setting the legend in its own framed box seems to be more trouble than it is worth, but in previous *Mathematica* editions it was quite simple.

In[7]:=
```
Plot[{y₁, y₂}, {x, 0, 4},
  PlotRange → {0, 1},
  ImageSize → Large,
  Frame → True,
  FrameTicks → {{0, 1, 2, 3, 4}, {0, 0.5, 1}},
  FrameTicksStyle → {{Automatic, Directive[FontOpacity → 0, FontSize → 0]},
    {Automatic, Directive[FontOpacity → 0, FontSize → 0]}},
  GridLines → {{0, 1, 2, 3, 4}, {0, 0.5, 1}},
  FrameLabel → {"x", "crazy functions of x"},
  PlotLabel → "Two Magical Functions",
  PlotLegends → Placed[{"Gaussian", "Sin of Gaussian"}, {.86, .75}]
]
```

Out[7]=

Other nice options are possible; do a search online for "*Mathematica* plot options". A good example is "Filling" for shaded plot curves.

In[8]:=
```
Plot[{y₁, y₂}, {x, 0, 4},
  PlotRange → {0, 1},
  ImageSize → Large,
  Frame → True,
  FrameTicks → {{0, 1, 2, 3, 4}, {0, 0.5, 1}},
  FrameTicksStyle → {{Automatic, Directive[FontOpacity → 0, FontSize → 0]},
      {Automatic, Directive[FontOpacity → 0, FontSize → 0]}},
  GridLines → {{0, 1, 2, 3, 4}, {0, 0.5, 1}},
  FrameLabel → {"x", "crazy functions of x"},
  PlotLabel → "Two Magical Functions",
  PlotLegends → Placed[{"Gaussian", "Sin of Gaussian"}, {.86, .75}],
  Filling → Axis
]
```

Out[8]=