

Here we use the `interact` command¹ to make some graphics –see [here](#) and [here](#) for some examples.

The general template is to start with:

```
@interact
```

after which one may define the quantities being inputted by `def _(...):`, eg the following:

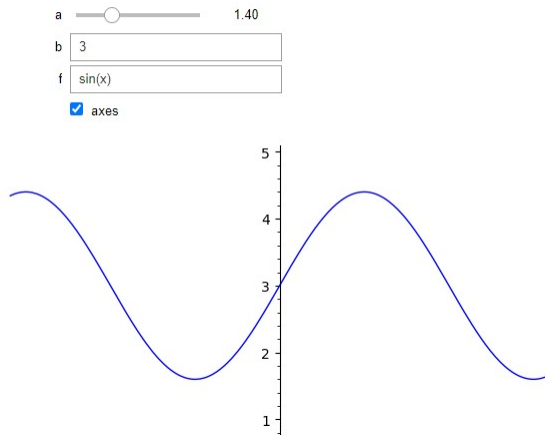
```
def _ ( a = slider(0,5,step_size = .1, default = 1), b = input_box(default = 0), f = input_box(default = x^2),  
axes = True ):
```

allows the user to input two parameters a, b (a with a ‘slider bar’ and b with keyboard) and an expression $f(x)$ and check whether one wants axes to be displayed. After the `:` ending the definitions of the input parameters, one may invoke the usual operations or commands to manipulate these quantities and then display them. For example:

```
show(plot(a*f + b, (x,-5,5), axes = axes, ymin=0, ymax=5))
```

will output scaled or translated graphs based on the users choices:

```
⌘ @interact  
def _ ( a = slider(0,5,step_size=.1, default=1), b = input_box(default=0), f=input_box(default=x^2), axes=true):  
    show(plot(a*f+b,(x,-5,5), ymin=0, ymax=5, axes=axes))
```



Finally note that when making graphics with `interact`, it is often better to fix the size of the graphics output, so that as one changes the parameters involved the whole range of the generated image does not need to change. Also it is often desirable to not update constantly, one does this by adding `auto_update = false` to the definition line, as explained at the end of the page [here](#).

EXERCISES:

1. Make an interact box which allows you to draw a given number of osculating circles along a parametrized curve of your choice.
2. For the osculating circle drawer of the previous exercise, modify the program to also display the vertices of the given curve.
3. For the same osculating circle drawer, modify the program so that the osculating circles are drawn along equal intervals of arc-length along the given curve.
4. Make an interact box which allows you to draw a given number of wavefronts to a given parametrized curve of your choice and choose (with checkbox) whether or not to display the given curves caustic.

¹The mathematica analogue is the `manipulate` command.