

## XPPAUT: Plotting a function $f(x)$

1. Start up your X-server (if necessary)
2. Download the .ode file **plot1.ode** from the course home page, and put it in a folder with a copy of your **xpp.bat** file. Drag plot1.ode to the xpp.bat file. XPPAUT should start up, if you have set up the paths properly.
3. To graph the function  $f(x)$ , click on: “Initialconds→Go”
  - (a) To save the curves on the graph one by one as you draw them, with only the last curve drawn saved otherwise, click on:  
“Graphic Stuff → Freeze → Freeze” This way you can add information for the key as well and change the colour or line type (a number 1-10) in the pop-up box.
  - (b) To save the original curve and all subsequent curves instead, before you start graphing click on: “Graphic Stuff → Freeze → On freeze”
4. To change the ranges of plotting, define the reserved parameters **xlo**, **xhi**, **ylo**, and **yhi** appropriately in an option line (lines preceded with @). Clicking on “Window/zoom→ Fit” can also be helpful. “Viewaxes→ 2D” and fill in the pop-up box also works.
5. To change the function you wish to plot or add a new function to the same graph, click on : “File→Edit→Functions” and change the function (or modify the program plot1.ode directly BEFORE entering XPPAUT). To add the next function click on “Initial→Go” once more.
6. To start working on a new graph, click on: “Makewindow→Create”  
You can then add curves to either graphics window. Just click on the graphics window in which you want to add the curve first. To program multiple curves in the .ode file use the nplot command (see file plot\_multiple\_functions.n.ode)
7. To save the figure you created in a postscript file (.ps extension), click on:  
“Graphic Stuff→Postscript” (or use SVG or a screen shot if you do not have a postscript interpreter).

I recommend you download a postscript interpreter. I use the free software “Evince” downloadable for free for Windows from <https://evince.en.softonic.com/>. A version also exists for Macs, but I have not tried it and there might other options.

After clicking on:

“Graphic Stuff→Postscript” fill out the pop-up boxes. I recommend a fontsize of 24. You can rename the file now or later. *Becareful, if you do not rename the file, it might get over-written the next time you save a graph!* The file is usually saved in the folder you just created or sometimes it appears on the Desktop.

8. To label the axes click on:  
“Viewaxes→2D” and fill out the pop-up box. You can change the axes limits this way as well.
9. To add the key, click on: “Graphics stuff→Freeze→Key→Key” and use the mouse to place.
10. To define iterates of the function you can define  $f(f(x))$  for the 2nd iterate of  $f(x)$  and  $f(f(f(x)))$  for the third iterate of  $f(x)$  etc. as in plot\_multiple\_functions.o.ode or more efficiently you can define a parameter  $p$ , and then the  $p$ th iterate of  $f(x)$ :

```
ff(x,p)=if(p<=0)then(x)else(ff(f(x),p-1))
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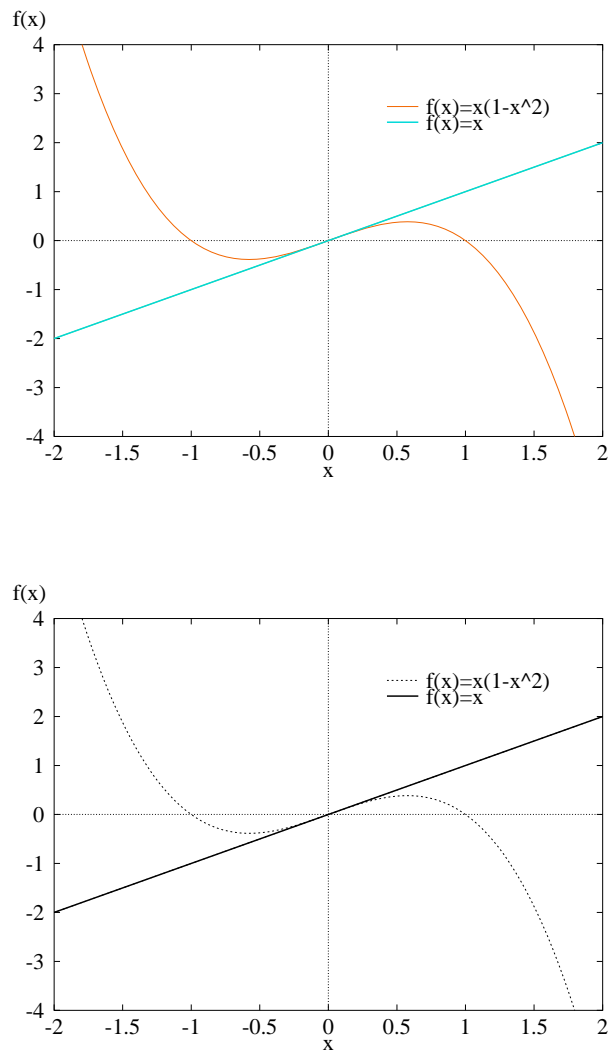


Figure 1: The graph of the functions  $f(x) = x(1 - x^2)$  and  $f(x) = x$ . (LEFT) in colour selecting 1, and (RIGHT) black and white selecting 0, in the pop-up box that comes up when you click on “GraphicStuff → Postscript”. If you do not have a postscript interpreter you can save using SVG instead.