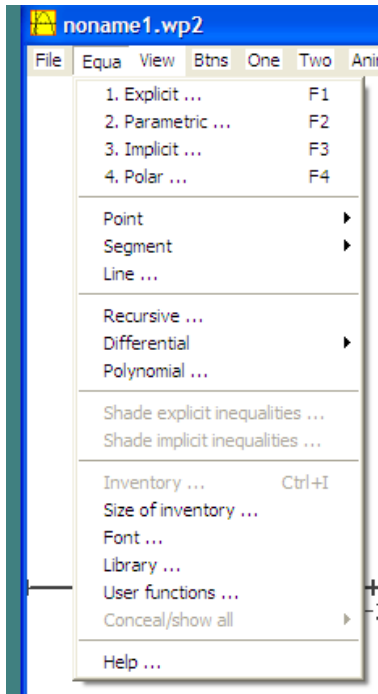


Where to find calculus operations in Winplot

This is a partial list of the items in the drop down menus that refer to concepts taught in calculus. Each drop down has its own **HELP** screen for more information on the items on that screen.



EQUA dropdown

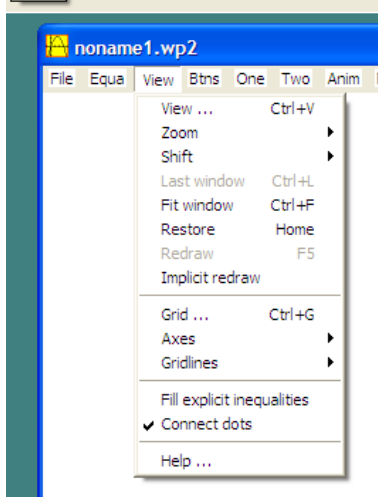
Input equations of the type indicated.

Draw points, segments and lines by specifying 2 points

Slope fields – use the “Differential”

Library is the list of built-in functions and their syntax

“User Functions” allow you to enter your own functions and refer to them in functional notation.

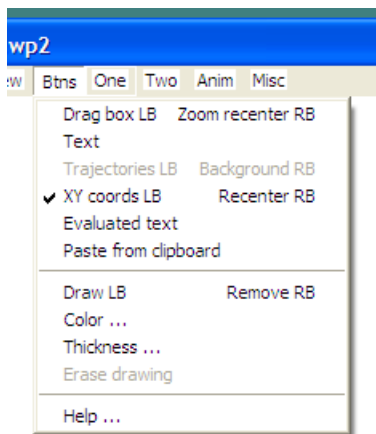


VIEW dropdown

Use “View” to set window

Use Grid to specify axes type, tick marks scaling etc.; also rectangular or polar graphs. Copy (Ctrl+C) blank graphs into tests.

“Fill explicit inequalities” shades regions between graphs.

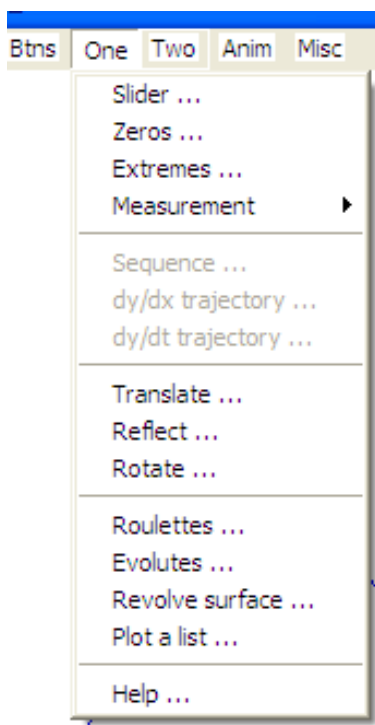


Btms (mouse button) drop down

“Drag Box” sets left button to draw box on graph and re-graphs. “Zoom re-center” uses right button to re-center graph.

“Text” Right click and enter text on graph. Move location with mouse.

“XY cords LB” click the left button for the coordinate of the pointer; click the right button to re-center the graph at the pointer.



ONE drop down. Use for things you do with one function at a time.

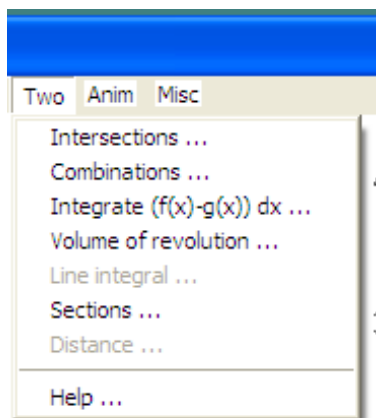
“Slider” traces the graph with a slider. Also draws and moves tangent lines, secant lines and Taylor Polynomials

“Zeros” find and makrs zeros and gives their coordinate.

“Extremes” locates local and endpoint maximums and minimums

“Measurement” gives area between graph and axes (but see TWO – Integrate), sector area, arc length, surface area of revolution, volume of revolution.

“Revolve Surface” Gives 3D graph of a revolved curve.

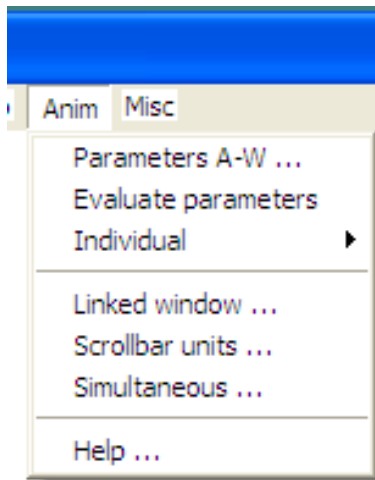


TWO drop down – things you can do with 2 functions

“Intersections” locates and gives coordinates of intersection of 2 graphs

“Integrate” finds area of the region between 2 graphs by left, right, midpoint, random, Riemann sums, Trapezoidal rule, Simpson’s rule.

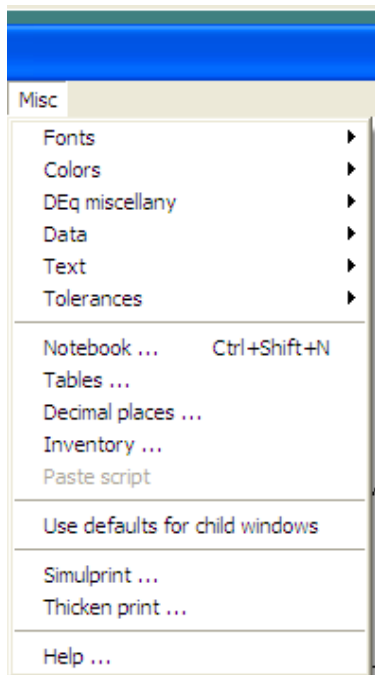
“Sections” draws 3D pictures of solids with regular cross sections.



ANIM controls the animation of figures.

You may enter a function with any parameter(s) e.g. $y = mx + b$ and then use “Individual” to get sliders for the parameters (m and b). Then use the slider to see the effect on the graph.

“Evaluate parameter” if checked will copy the current graph with the current value of the parameters. To do this use the “Parameters A-W” window and the duplicate button in the Inventory.

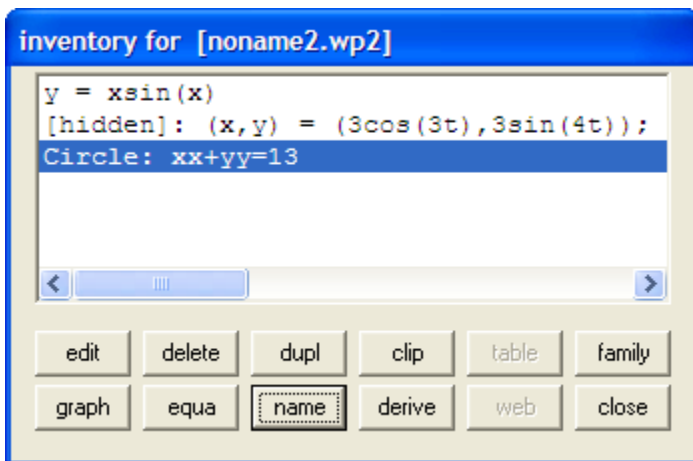


MISC – miscellaneous lets you set the various items listed.

“Notebook” toggles a window on and off in which you can write notes or directions.

“Tables” produces tables of values for one function at a time.

“Inventory” lists the functions that are graphed. See next screen.



Inventory (Ctrl+i) Lists the functions graphed.

Select a graph and

“Edit” lets you edit the function.

“Graph” hides or shows the selected graph (see second line)

“Delete” deletes the graph

“equa” prints the equation on the graph in the same color as the graph.

“dupl.” duplicates the graph. You can use this to then edit the second graph slightly.

“name” adds a name to the inventory (see third line)

“derive” draws the derivative of the selected function (but not relations).

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Download Winplot here: <http://math.exeter.edu/rparris/winplot.html>

Google Winplot for instructional sites.

Instructions for running Winplot in Mac OS X: <http://cotterphinney.com/winplot/>

Winplot Tricks

1. **Limited domains** can be entered in the various Equa windows. Click “lock interval” and enter the ends of the domain as the low and high values. The default is the left and right edges of the window.

2. **Piecewise Defined Functions:**

The library also has constructors for piecewise (spliced) functions, namely joina, joinb, joinc, ..., and joinz. For example, for the function

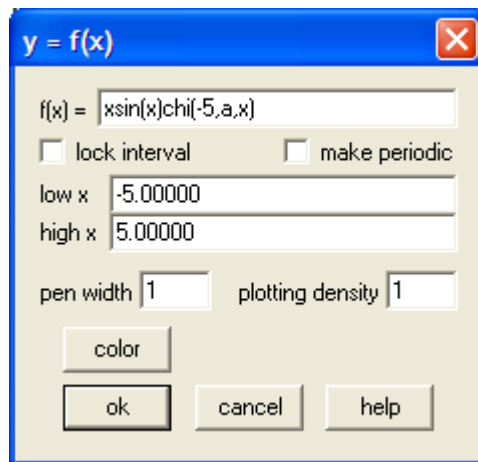
$$y = \begin{cases} f(x) & x \leq c \\ g(x) & c < x \leq d \\ \dots & \dots \\ h(x) & \text{otherwise} \end{cases} \quad \text{use } \mathbf{joinx(f(x)|c,g(x)|d,\dots,h(x))}$$

For example, try graphing $y = \text{joinx}(x+1|0,1-x^2|2,-1)$.

3. **To grow the graph in one direction** use the Characteristic function, *chi*.

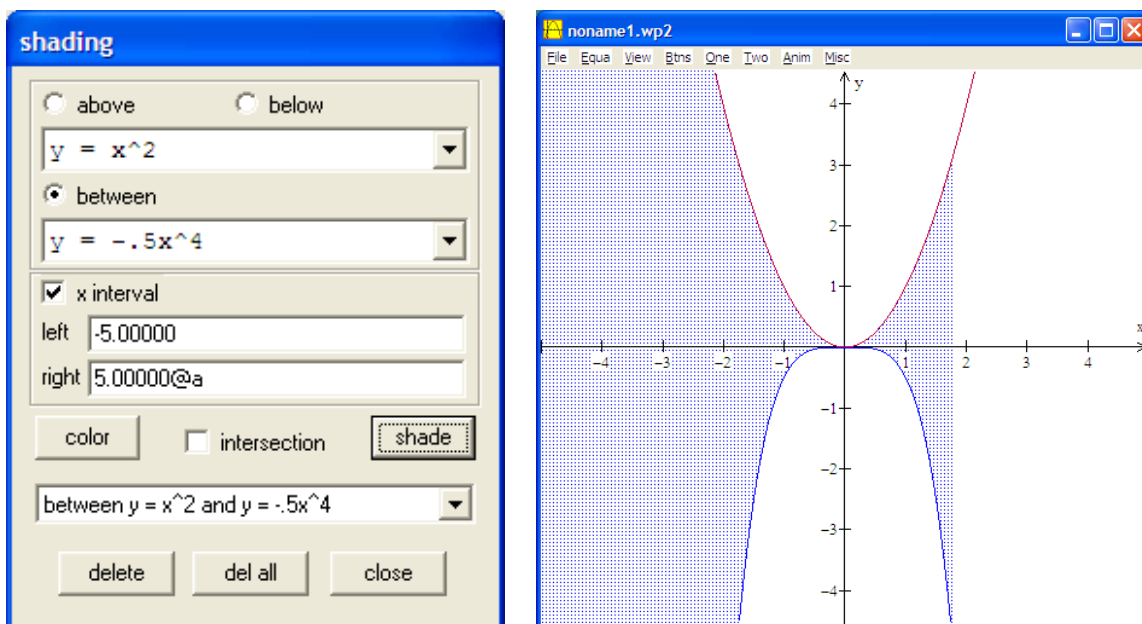
$$\text{Use } \mathbf{chi}(a,b,x) = \begin{cases} 1 & a < x < b \\ 0 & \text{otherwise} \end{cases}$$

For example this is how to enter the function $y = x \sin(x)$. Then using the A and or B sliders you can slide the end of the graph left or right. A or B may be a constant, in which case the graph will end at that value. This may be used with any function or segment.

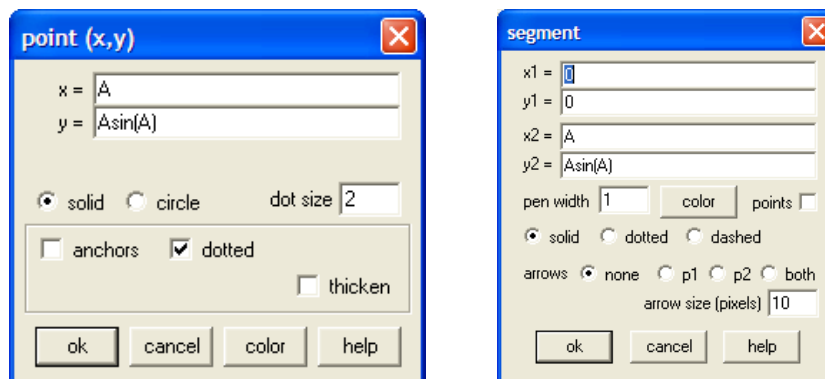


- To shade between two graphs from a fixed value to a moving x value click on Equa > Shade explicit inequalities. Pick two functions and check the buttons in the window as desired (Between is usual). On one or both of the “Left” and “right” slots append an “@a” (or any letter) and then click “shade.” Use the “A” slider to move the edge of the shaded region.

(There may be a small bug here. If this does not work, enter a slider value elsewhere in the problem and then try this. If it works you can then remove the slider value.)



- The same idea (#4 above) works in other places. Try it with Revolve Surface operation. (Use the ANIM from the 3D screen.)
- To move a point or one end of a segment along a curve enter the point as $(A, f(A))$:



7. (2003 AB 1) **To make a moving segment between two curves** copy this set up. Use the B slider. The segment is entered as a parametric equation of a vertical line ($x = b$) with one function multiplied by t and the other by $(1 - t)$. Set the t values as shown (0 and 1). The B slider will move the segment whose endpoints are on $y = \ln(x)$ and $y = x - 2$ left and right. Make the “Set L” and “Set R” values equal to the points of intersection to keep the segment in the region. When this segment is rotated its 3D plot will be a “washer” used in the Riemann sum for this solid (red in figure).

