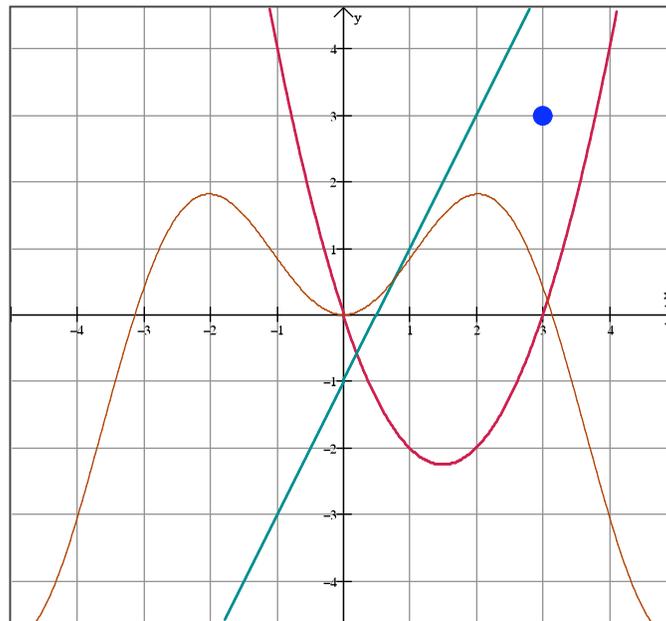


# An Introduction to WinPlot



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## Acknowledgements

Thank you to Steve Simonds for Portland Community College for providing the video used when researching and preparing this manual. His website: <http://spot.pcc.edu/~ssimonds/winplot/> contains numerous instructional videos for WinPlot.

## Installing WinPlot

The download for WinPlot is a compressed file. Download a trial for WinZip at <http://www.winzip.com/> to extract the files.

1. Go to the following website: <http://math.exeter.edu/rparris/winplot.html>
2. Click on the link: Winplot for Windows 95/98/ME/2K/XP (558K) (27 Feb 2006)
3. When prompted, click save to save the file to the desktop.
4. Double click the icon wp32z.exe on the desktop.
5. WinZip will prompt to extract the files to C:\peanut. Click "Unzip".



6. WinPlot is now installed in C:\peanut directory.

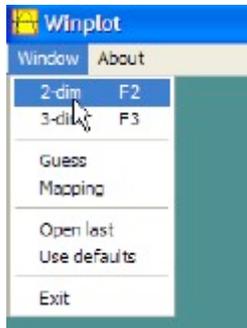
After WinPlot is installed, check back often to see if the software is updated. Most users forget to do this.

## Basics of WinPlot

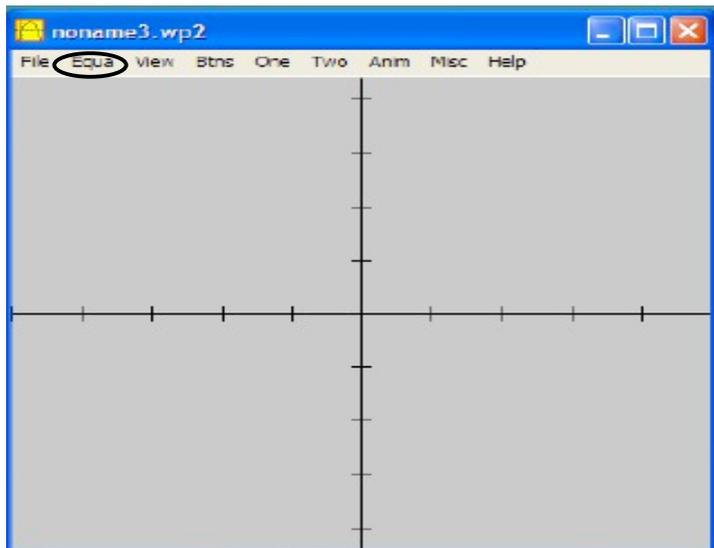
The first time WinPlot is used, the screen will look like this:



From the **Window** menu, select 2-dim.



A blank grid will appear below.

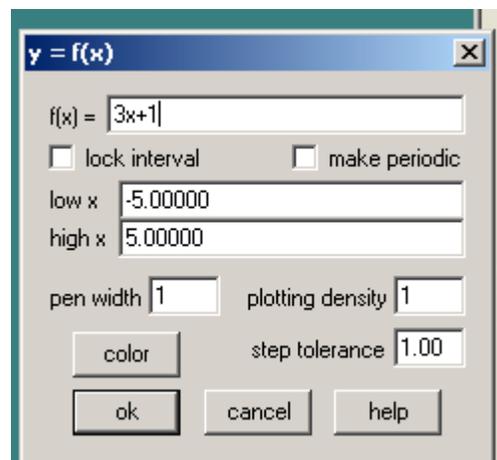


From the **Equa** menu, select 1: Explicit

- The following dialog box will appear:
- Type the equation for  $f(x)$ .

Use ^ for exponents.

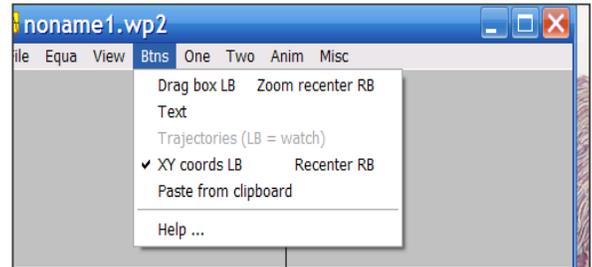
Example:  $f(x) = 3x^2$  will graph  $f(x) = 3x^2$



## Btns Menu

Very Important: This menu controls the functionality of the mouse buttons. Only one option may be selected at a time. If the user wants to move the labels for the graph around, make sure the Text menu has a check beside it.

- **Drag Box LB** - When selected, left click and drag a rectangular section of the graph. This changes the viewing window.
- **Zoom recenter** – When right clicking in an area, recenters the graph.
- **Text** – When selected, using the mouse allows the user to drag any labels or text.
- **XY cords LB** – When clicking with the left mouse button, the coordinates of the ordered pair appear.
- **Recenter RB** – When right clicking, the graph view changes
- **Paste from clipboard** – When clicking, whatever was in the clipboard is pasted onto the plot area.

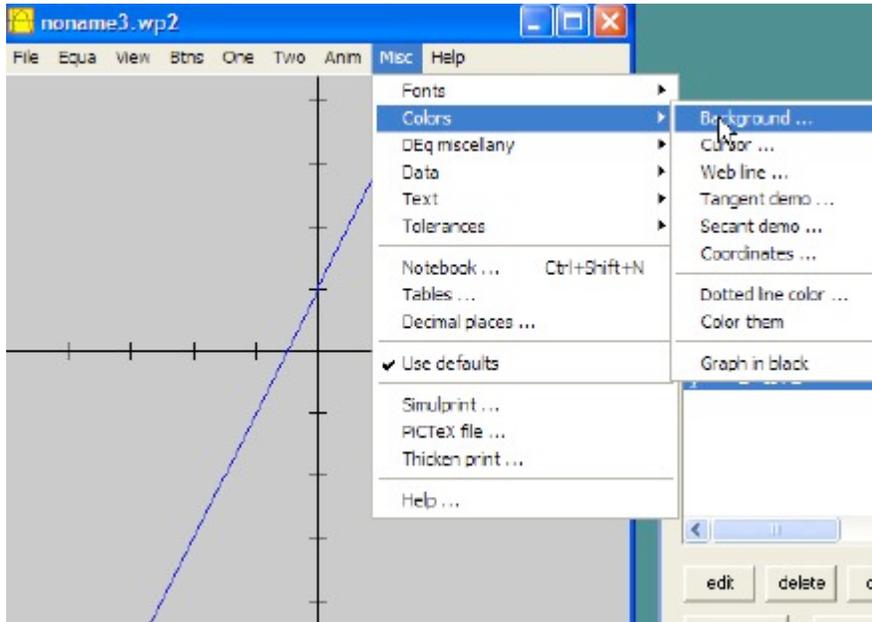


Reminder: Only one option is selected. Check this before proceeding. Change to Text if you want to move labels.

## Formatting

### Changing the Background:

- From the Misc menu of the graph, select "Colors."
- At the right arrow, select background.



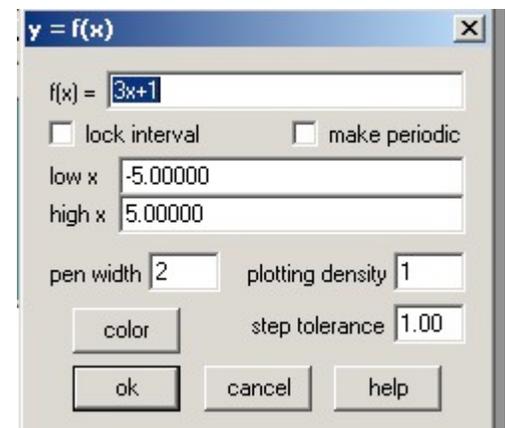
- Click on the background color of choice.
- Click Close. The background color is now changed.

### Changing the appearance of the graph itself:

- Ensure the Inventory Window is open (Select from the Equa Menu, Inventory)
- Click on the graph to format. Select "edit."

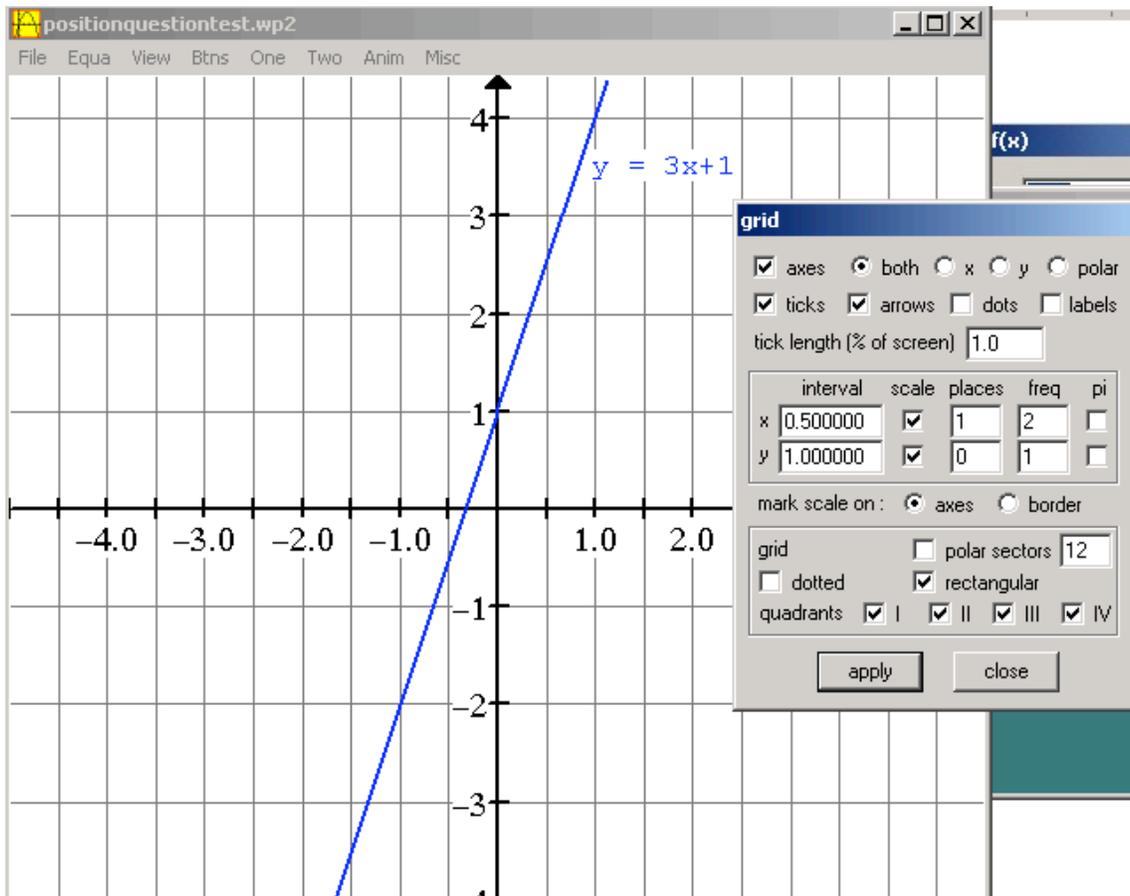


- Change the pen width to change the thickness of the graph.
- Click on the color button to change the color of the graph.



## **Changing Scales, Axes, Labels, and Grids:**

- From the **View** menu, select grid.
- A dialog box appears. Check what applies:



The lines that appear on the screen will appear on the printed version.

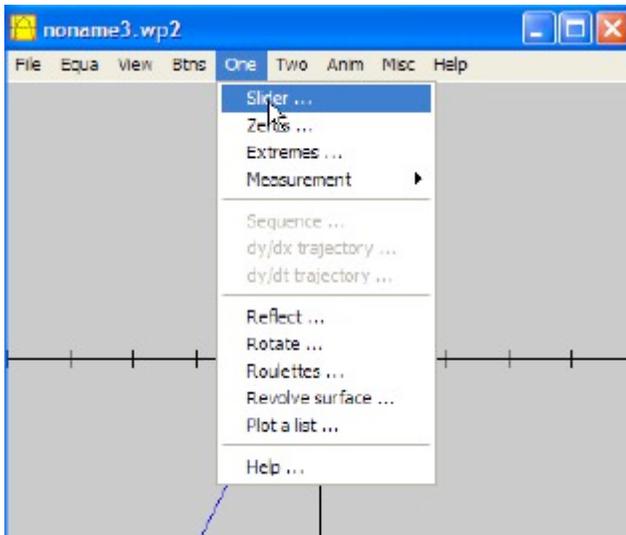
## **To further refine the appearance of the graph:**

- From the view menu, select from the axes submenu: arrow or solid arrowheads.
- From the view menu, select from the axes submenu: label edit to change the axes name for meaningful axes names.
- From the view menu, select from the gridlines submenu: change the color and thickness.
- From the **Misc** menu – select the fonts submenu – change the scale on axes font to a larger font size if planning on pasting into Word and resizing the graph.
- To have the equation show up on the graph, select from the inventory dialog box (**Equa** menu: inventory), show equation button. This is moveable.

## Working With The Graph

### To get coordinates of the points:

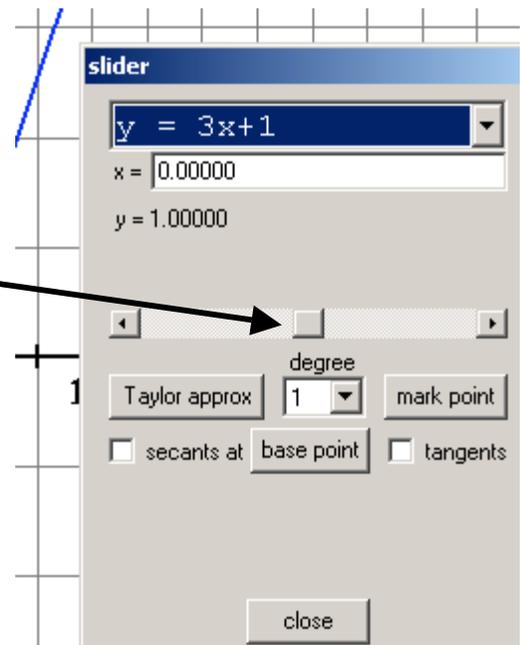
- Select from the **One** menu: Slider.



A slider dialog box will appear:

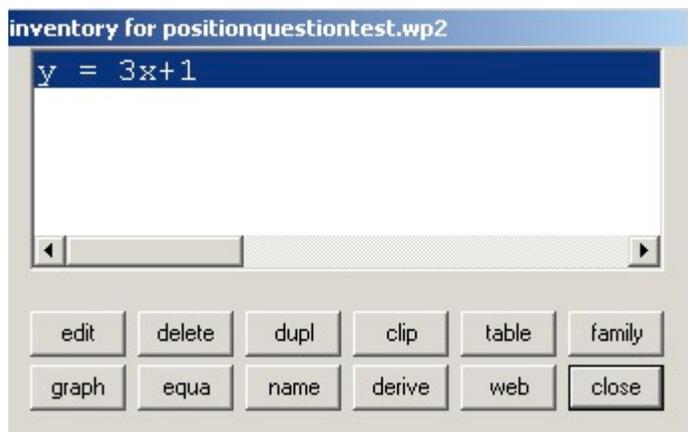
- Select the function from the drop down menu.
- Move the slider to see the various points.

Note the crosshair located on the graph.



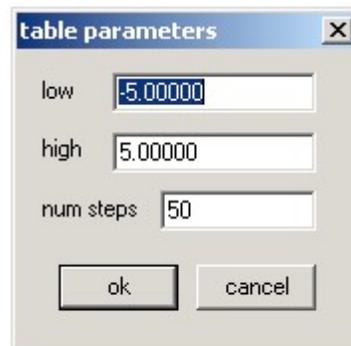
### **To Generate a Table of Values:**

- Select from the **Equa** Menu: Inventory.
- Click on the Table button.



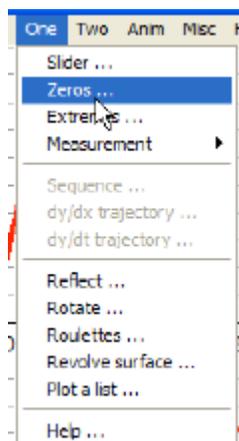
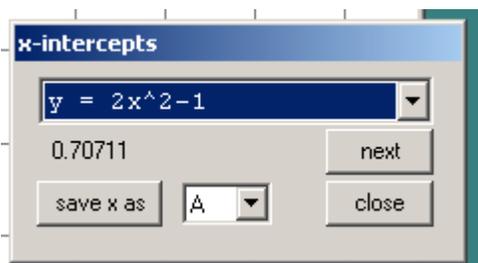
A table appears.

- While this table is open, select the **params** menu:
- Modify the low, high, and num steps.



### **Calculating Zeros of A Function:**

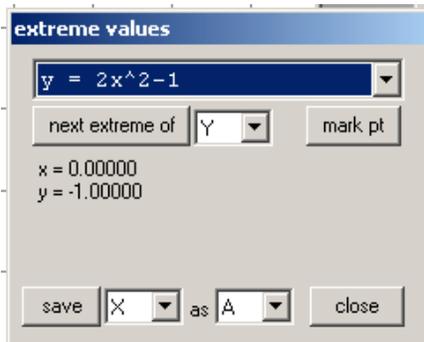
- Select from the **One** Menu: Zeros.
- A dialog box will appear.



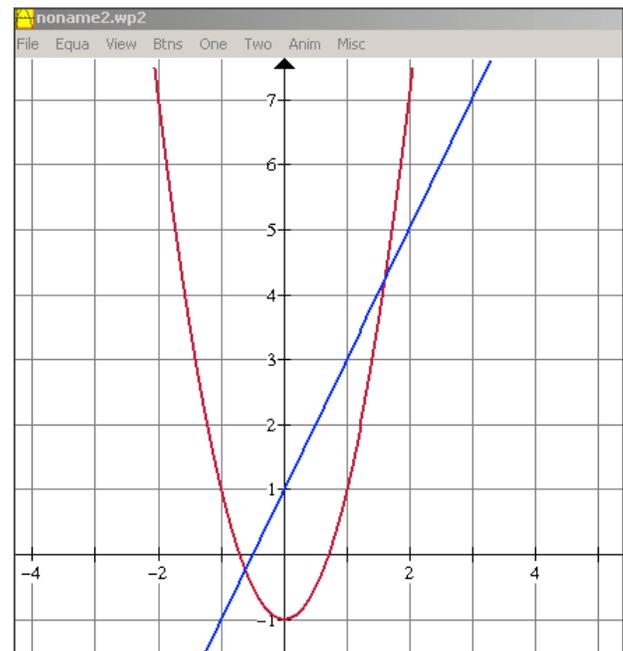
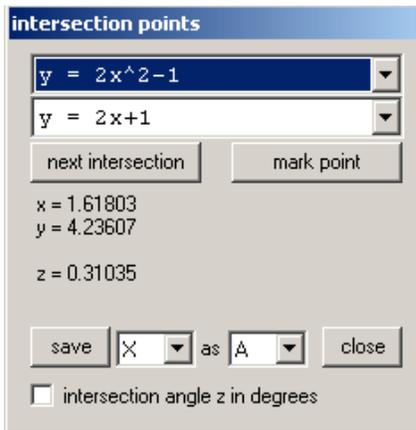
- Click the next button to see the next intercept.
- This feature will only find the intercepts that are visible in the current viewing window.

## Calculating Extreme Values of a Function:

- Select from the **One** Menu: Extremes.



- **Finding Points of Intersection:**
- Select from the **Two** Menu: Intersections.
- From the drop down menus, select the curves. Click next intersection for more points.



## The Viewing Window

### Arrow Keys

To change the viewing window manually, use the arrow keys on the keypad.

### Using the View Menu

Select from the **View** Menu, the View Submenu.

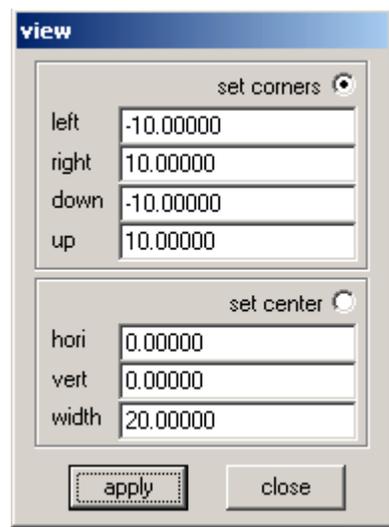
#### Set Corners Option

Similar to Graphing Calculator Window.

#### Set Center Option

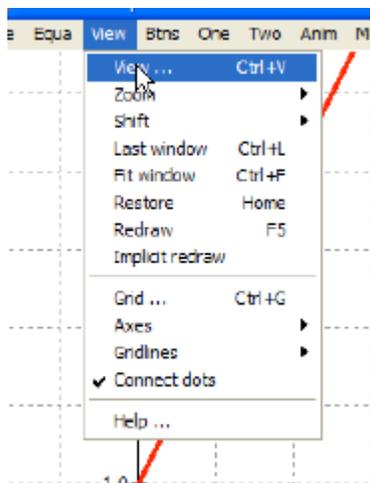
Enter the coordinates for the point that represents the center of the graph.

Enter the units in the horizontal direction for the width.



Click Apply.

### Other View Options:



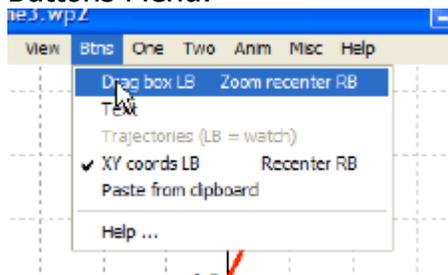
**Zoom SubMenu** – Zoom Out or Zoom In (pgUp & PgDown Keys).

**Last Window** – Last viewing window used.

**Restore** – Similar to Zoom Standard on the graphing calculator – 5 by 4 viewing window.

**Fit window** – Similar to Zoom Fit. Changes the vertical scale to fit maximum or minimum function value.

### Buttons Menu:

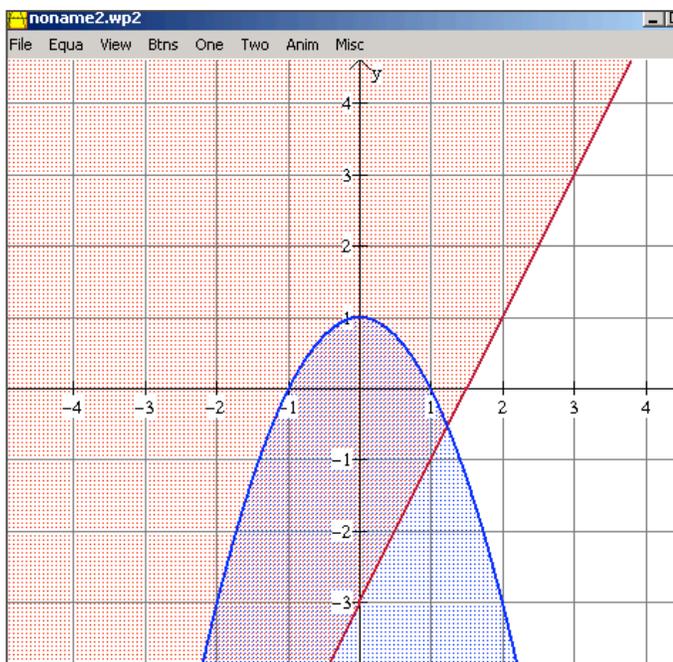
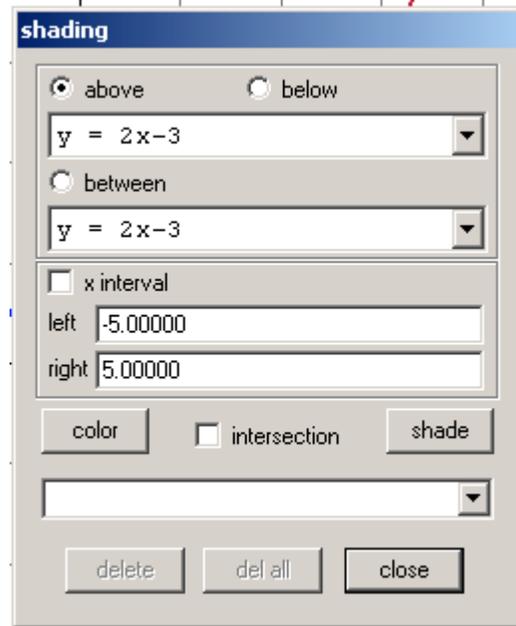


**Drag Box** – Click and drag a rectangular portion of the graph. The graph will be resized.

## Graphing Inequalities

One limitation of WinPlot is that it does not have a feature for making the lines dotted when entering them into the equation via the method: **Equa** Menu - Explicit.

- Select from the **Equa** menu: Explicit.
- Type the equation(s) into the  $f(x) =$ .
- Select from the **Equa** menu: Shade Explicit Inequalities.
- A dialog box will appear:
  - Select from the drop down menu the graph to shade. Select the option button above or below.
  - Select from the color button the color choice.
  - Click the shade button.
  - To shade another graph, select the graph from the drop down menu and select above or below.
  - Change the color and click shade.
  - When finished click Close.
  - The system of inequalities is now shaded.



Suppose the inequality is:

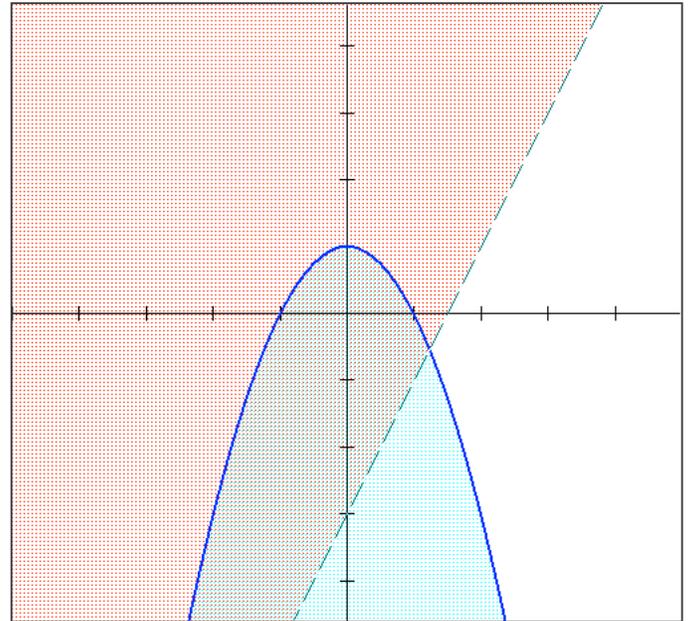
$$y \leq -x^2 + 1$$

$$y > 2x - 3$$

However, the line  $y = 2x - 3$  is not dashed.

**This only works for lines (not quadratics):**

- Select from the **Equa** Menu: Line.
- Enter the equation in form  $Ax + By = C$ .
- Select dashed – use a point size of 1.
- Select from the **Equa** Menu: Inventory.
- Click on the equation of the line to make dashed ( $y = 2x - 3$ ). Click on the graph button. It will now show up as “hidden” in the inventory.



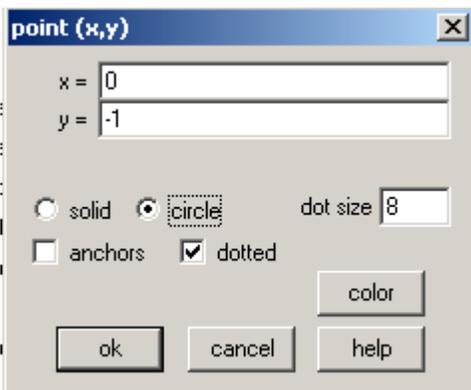
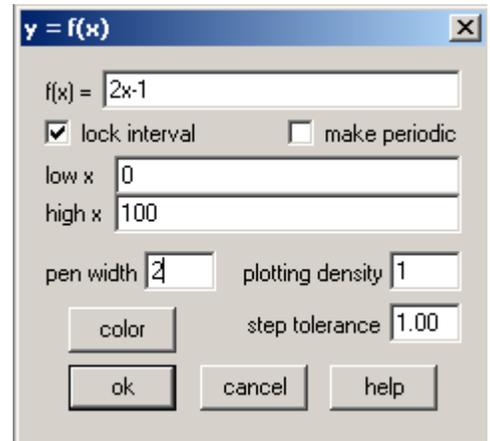
### Graphing Piecewise Functions

To graph the following:  $f(x) = \begin{cases} 2x - 1, & x > 0 \\ x^2, & x \leq 0 \end{cases}$

- Select from the **Equa** menu: Explicit.
- Type  $2x - 1$  into  $f(x)$  Select the check box: Lock interval.
- Since  $x > 0$ , set low  $x = 0$  and high  $x$  an arbitrary large number so that zooming out the graph is still visible.

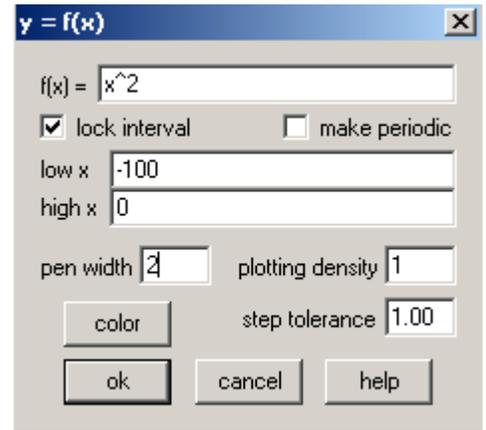
To graph the open circle at  $(0, -1)$ :

- Select from the **Equa** menu: Point ->  $(x,y)$ .
- Enter the coordinates in the dialog box. Select circle.
- Change the dot size to something larger.

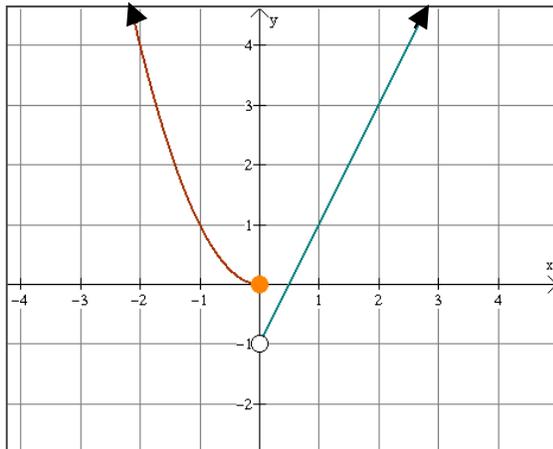


Graph the equation  $y = x^2$  in the equation menu.

- Check the box: Lock interval.
- Since  $x \notin 0$ , enter an arbitrary negative for low x and enter 0 for high x.
- Plot the point (0,0). Select solid for that dot.



The resulting piecewise function is shown below.



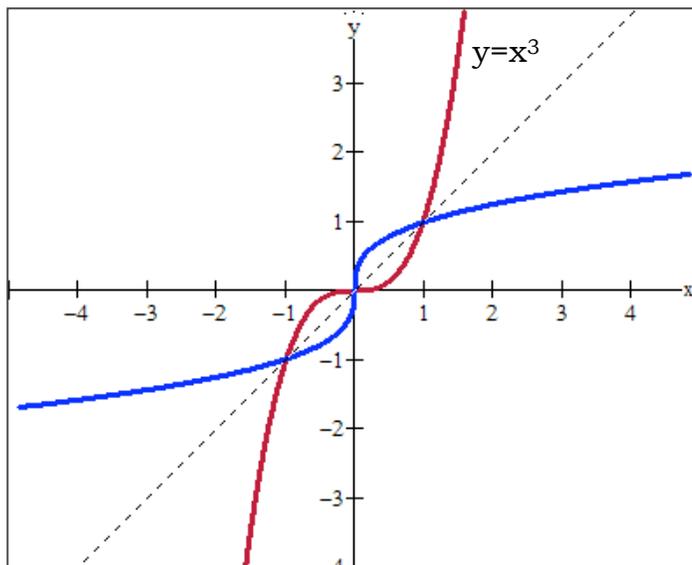
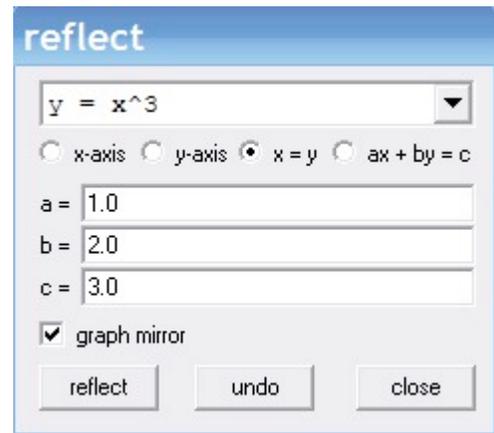
💡 To add arrowheads and axes, use the drawing tools and grouping features of Word.

### Graphing Reflections

Graph the equation  $y = x^3$ . (Equa: Explicit)

- Select from the **One** menu: reflect.
- Select the graph to reflect.
- Select the option button to reflect.
- Check the box "graph mirror" to see the line the graph is reflected.

To reflect about any other line: enter the values of a, b, and c for the equation of the line.

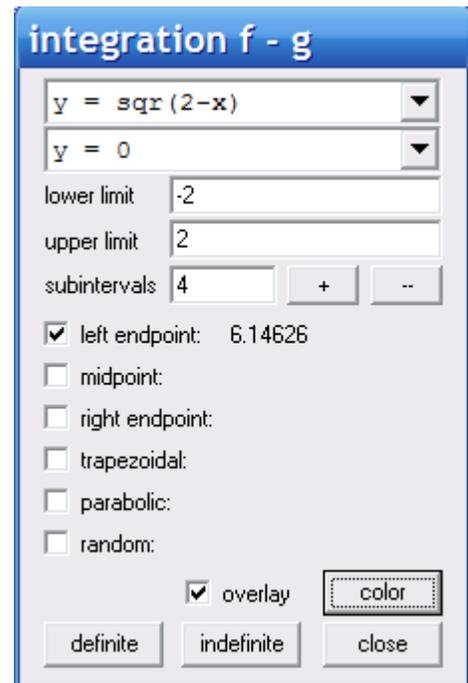
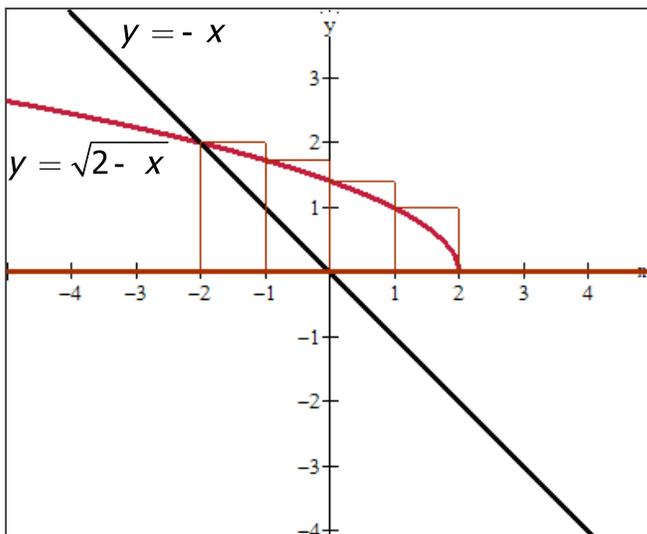


## Area Under a Curve

Find the area of the region enclosed by  $y = \sqrt{2-x}$ ,  $y = -x$ , and  $y = 0$ .

- Enter the three equations under the Equa: Explicit Menu.
- Select from the **Two** menu: Integration...
- Select the top curve and bottom curve from the drop down menus:
- Enter the left-x value for the lower limit.
- Enter the right-x value for the upper limit.
- Change the number of subintervals.
- Select the rectangle method to use.
- Click the box "overlay" to see the rectangles.
- Click the definite button.

The following graph illustrates the left endpoint approximation:



## Generating Solids of Revolution

Find the volume of the solid generated when the region enclosed by  $y = \sqrt{x}$ ,  $y = 0$ ,  $x=2$ , is revolved about the line  $x = 2$ .

- Enter  $y = \sqrt{x}$  and  $y = 0$  into Equa: Explicit.
- Select from the **One** menu: revolve surface.
- Select the first graph to rotate.
- Enter the values of a, b, and c to create the equation of the line to rotate.
- Enter the left-x coordinate for arc start.
- Enter the right-x coordinate for arc stop.
- Since the revolution is  $2\pi$  accept the default for angle start and stop.
- Click the "see surface" button.

Repeat the steps above for the second equation.  
Use the arrow keys to move the surface.

surface of revolution

$y = \text{sqrt}(x)$

axis  $ax + by = c$

a = 1

b = 0

c = 2

arc start 0.00000

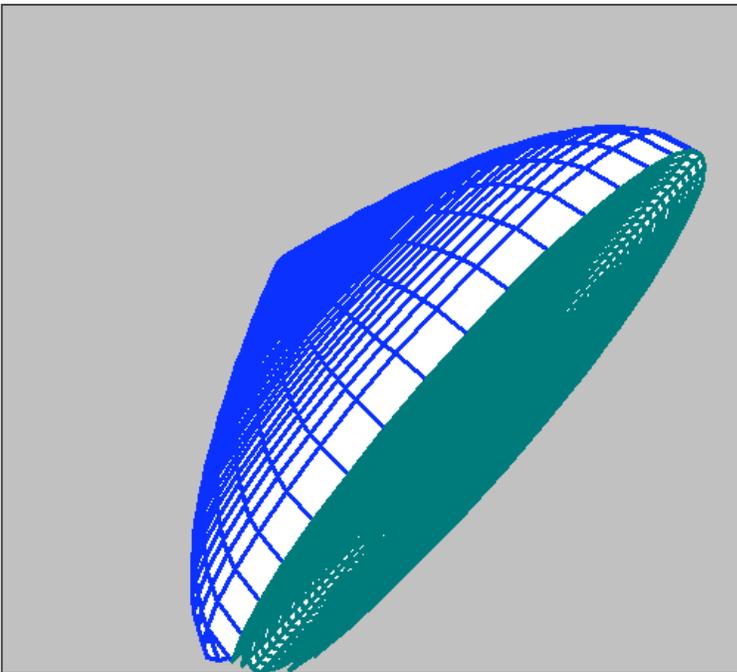
arc stop 2

angle start 0.00000

angle stop 6.28319

see surface

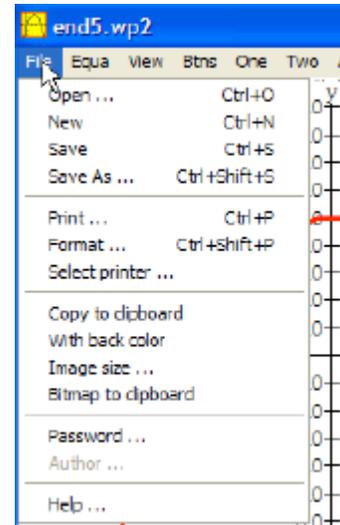
close



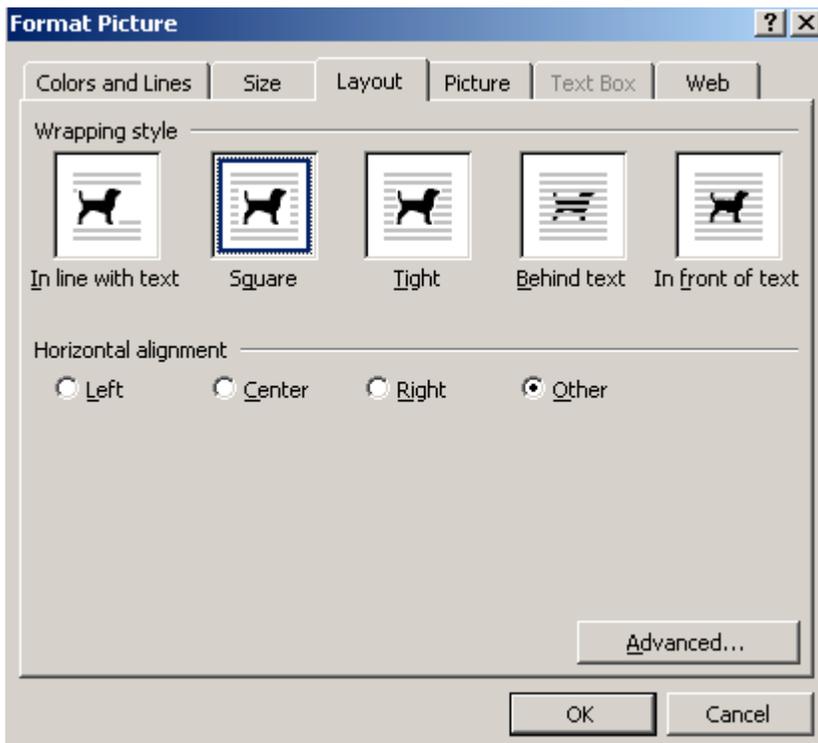
## Importing into Word

### Copying Sketches into Word

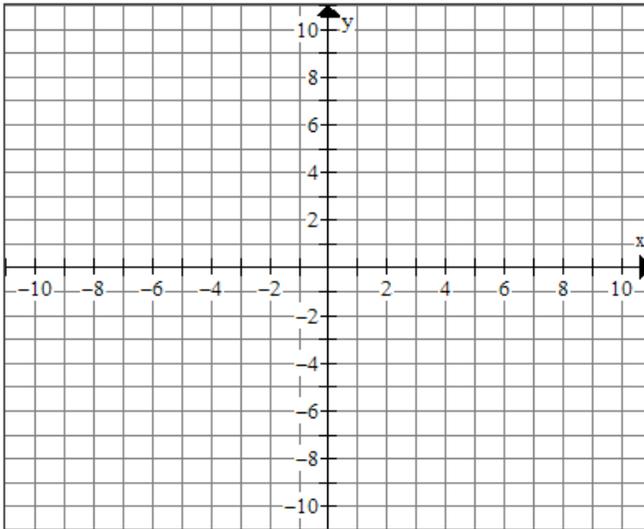
- Select from the **File** menu: Bitmap to clipboard or Copy to clipboard.
- When selecting Bitmap to clipboard an alert will appear "image gone when window closed."
- Click OK.
- Open Word.
- Select Edit Paste (Ctrl V). The image is now inserted.
- To make the image "draggable" - right click on the graph and select Format Picture.



To format the image so that text wraps around appropriately, right click on the image and select format picture. Select from the Layout tab, Square. Select the horizontal alignment.



## Example Images Created Using WinPlot



A blank grid is easy to create. Change the View and Grid options and save this grid. Insert it into word.

This graphic was created by shading under the curve and using the two: integration menu for generating the rectangles. The drawing tools in word were used to thicken the rectangles.

