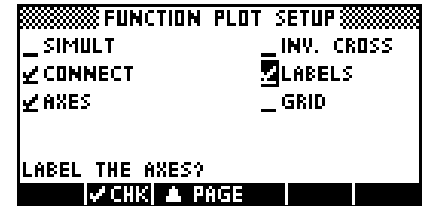
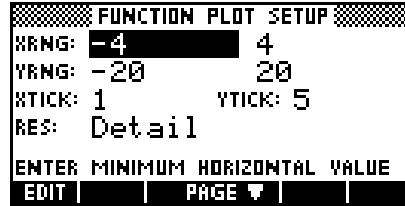
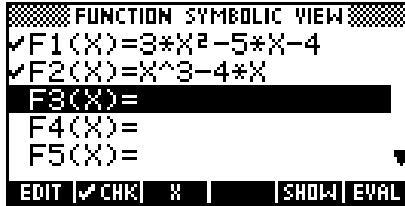


Signed area...

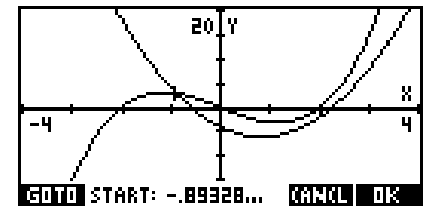
In the examples and explanations which follow, the functions and settings used are:



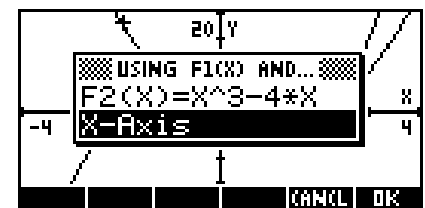
Another very useful tool provided in the **FCN** menu is the *Signed Area* tool. Before we begin to use it, make sure that **TRAC** is switched on, and that the cursor is on F1(X) - the quadratic. The *Signed Area* tool is similar to the Box Zoom in that it requires you to choose start and end points of the area to be calculated.

Suppose we want to find the definite integral: $\int_{-2}^3 x^2 - 5x - 4 dx$

Choose **FCN** and then *Signed Area*. At the bottom of the screen you will see a prompt, as shown right, asking you to choose a starting point.

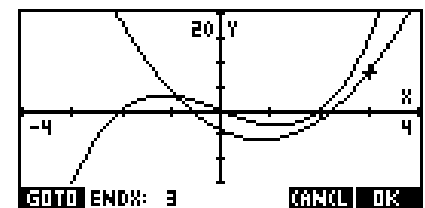


Press the **GOTO** key, enter the value -2 and press **OK** or ENTER. The starting value will then be -2 so press **OK** again (or ENTER) to accept it.

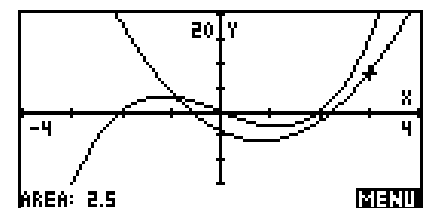


Another menu will now pop up, asking you to choose what area you wish to calculate. In this case there are only two choices: between F1(X) and the x axis, or between F1(X) and F2(X).

If we had defined more functions in the SYMB view then this menu would be longer. In this case we want the area between F1(X) and the x axis, so position the highlight as shown and press ENTER.



The graphs will then reappear, with a message requesting that you choose an end point. In the screenshot shown right I have pressed **GOTO** and entered the value 3 to move to that point directly.



If you now press ENTER again to accept the end point, the hp 39gs or hp 40gs will calculate the signed area and display the result at the bottom of the screen.



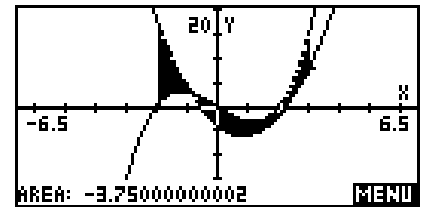
Calculator Tip

It should be clearly understood that although the label at the bottom of the screen is Area it is a little misleading.

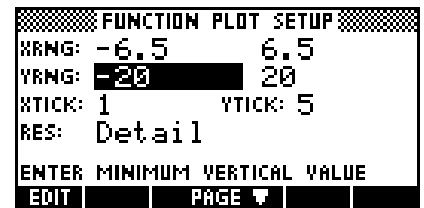
What has actually been calculated is the definite integral (right), with 'areas' below the x axis included as negatives. This is why the label on the original menu reads "Signed area" instead of just "Area".

$$\int_{\text{1st point}}^{\text{2nd point}} F1(X) dx$$

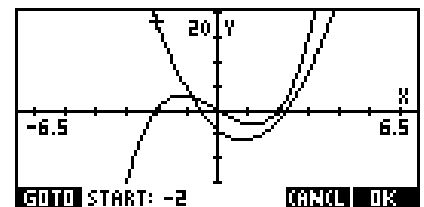
Rather than using the **GOTO** key, an alternative method is to use the tracing facility. The advantage of this is that the 'area' is shown visually as you go by shading, as can be seen right.



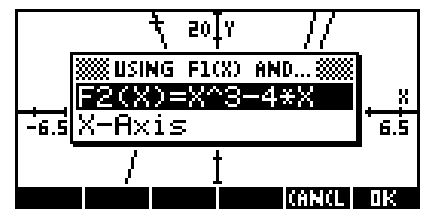
The disadvantage of this is that you can only trace to values which are permitted in the scale you are using. As soon as you use **GOTO** the shading stops. In this case, due to the scale we chose, if you try to trace to the values $x = -3$ or $x = 2$ you will find that they are not accessible. To illustrate the process we will need to change scale.



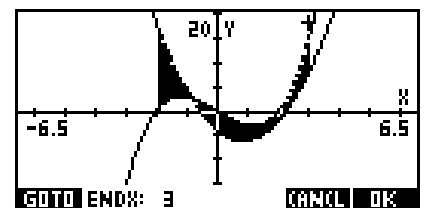
Change to the PLOT SETUP view and set the x axis (only) back to the default values -6.5 to 6.5, then PLOT again. This can be done by highlighting the XRng fields and pressing DEL.



Press **MENU** and **FCN** again, choosing *Signed Area...* as before. Use the left/right arrow keys or the **GOTO** key to move the cursor to $x = -2$. Press **ENTER** to accept the starting point.



This time, choose the boundary as $F2(X)$ instead of the x axis so that we will be finding the signed area between curves instead of the signed area under one. Again, note that the result will be a signed area (definite integral) not a true area. See one of the other extracts for a simple method of finding true areas.



We now need to choose the end point. This time do it by tracing with right arrow to move the cursor. As you do the area will be shaded by the calculator. The current position is shown at the bottom of the screen. When you reach the end point you are looking for, press the **OK** key and the area will be calculated as before. This is shown right. To remove the shading, press **PLOT** again to force a re-drawing of the screen.

