

Record your answers to each exercise on paper. **DO NOT TRY TO PRINT YOUR RESULTS.**

Derive is a TI product. If you have a TI calculator, then much of what you will see will be familiar. In fact, you can pass information back and forth between Derive and many TI calculators.

1. Show you how to log on to the network in the Tutt Science 213 computer lab.
2. Explain how to enter and exit the DERIVE for Windows mathematical software package.
3. Illustrate some of the features of DERIVE for Windows and how they apply to your coursework.

Logging on: -> find a machine
 -> turn on the computer (and the monitor); press CTRL-ALT-DELETE to log on.
 -> enter your user name and password
 -> you should now see the WINDOWS screen

Entering DERIVE:

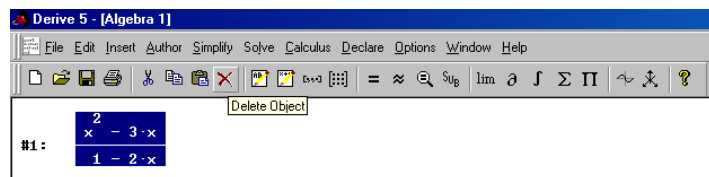
-> with the mouse, select on the lower left corner of the display:
Start|Programs|Math & Computer Science|DERIVE 6|Derive 6 (this may vary slightly);
 answer **Yes** to select the default settings. You should now see the DERIVE for Windows algebra screen. To exit DERIVE, you will select **Files|Exit**

Logging off: -> When you are finished, be sure to log off. To do so, press CTRL-ALT-DELETE. You may leave the computer and monitor turned on if other students are likely to need the equipment soon.

Exercise 1: Record any difficulties in logging on or accessing Derive.

Working in DERIVE for Windows:

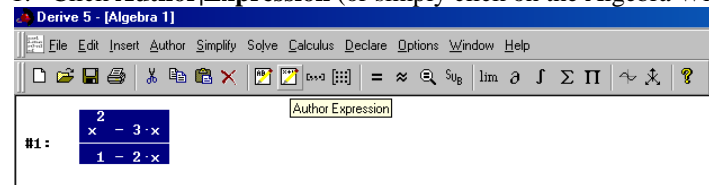
When **AUTHORing** an expression, use the usual algebra notation except that ^ signifies exponentiation, SQRT(...), for square-root, ABS(...), for absolute value, and **BE SURE TO PARENTHESE PROPERLY** in expressions like $(x^2-3x)/(1-2x)$.



If you **AUTHOR** incorrectly, you can remove bogus entries by clicking on the entry and then on delete:

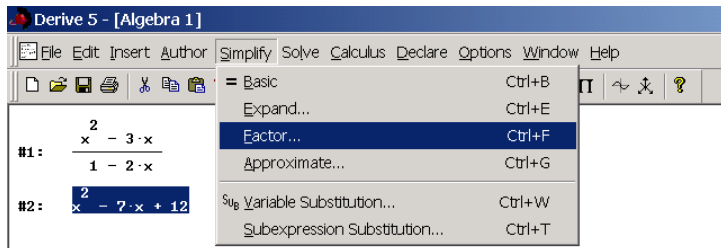
Using **AUTHOR**, **REMOVE**, **EXPAND**, **FACTOR**, **SIMPLIFY**, **CALCULUS**, **SOLVE** and **PLOT**:

1. Click **Author|Expression** (or simply click on the Algebra Window at the bottom);



type the expression $x^2-7x+12$; and press the enter ENTER key (or click the to the left of the Algebra Window). You will see it highlighted both below and in the algebra window.

Factor this quadratic using the **Simplify** menu. Select **Simplify|Factor** and click the **Factor** button.



The factored form will appear in the center of the algebra screen.

The reverse of this process is **Expand**. Select **Simplify|Expand** and press the **Expand** button. You will see the expanded form in the center of the algebra screen.

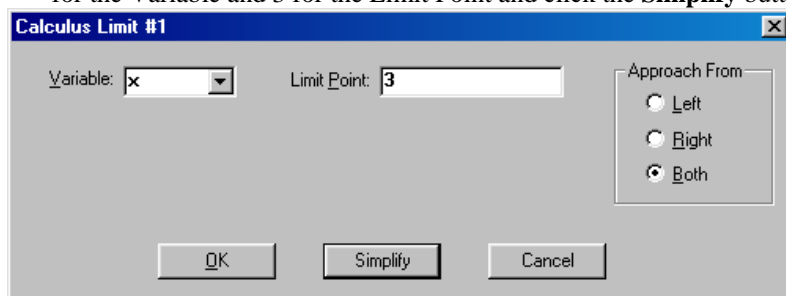
By default, Derive for Windows centers all the expressions that are results of operations.

2. Remove all expressions (highlight all of them and click the remove button).

The Key New Idea in Calculus:

During the first few days of class, we have been working to understand the notion of a limit. Derive can calculate many of the types of limits that we have considered. It also can help in the process of understanding the algebraic computations of a limit.

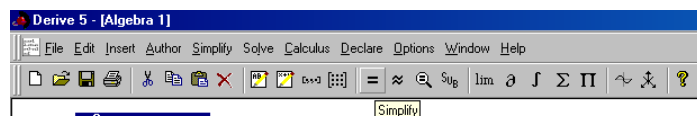
3. Author $(x^2 - 7x + 12) / (x^2 - 9)$. This expression is undefined when $x = 3$. What about a limit as x approaches 3? In other words, what happens as x approaches 3 without every equalling 3? Click **lim**; choose x for the Variable and 3 for the Limit Point and click the **Simplify** button.



Note the two new expressions appear in the algebra window.

To see behind the scenes for this process, follow these steps:

- Click on the numerator of the original limit expression. (This original limit expression should be expression #1 since you deleted all expressions previous to it.)
- Select **Simplify|Factor** and the **Factor** button.
- In the resulting expression, click on the denominator. Select **Simplify|Factor** and the **Factor** button again.
- You should now see the common factor of $x - 3$.



e. Be sure the new expression is highlighted and press the simplify button. The common factors cancel.

Exercise 2: Author the expression $(x^3 - 2x + 1)/(x^2 + x - 2)$; repeat steps 3a - 3e for this new expression. Record your answer (an expression involving x) on paper.

4. Remove all expressions from the algebra window (click the **X** to the left) and author the expression $f(x) := x^3 + 4x^2 - x + 20$. **MAKE SURE YOU USE := AND NOT JUST = !!** The $:=$ tells Derive to assign this somewhat complicated formula to the function f . Now, you can use $f(x)$ as if it were the formula.

To construct the difference quotient that we have been studying, do the following:

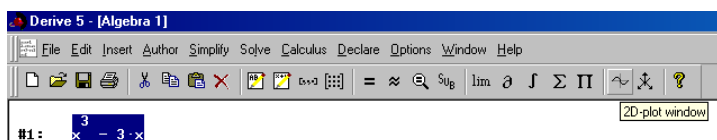
- Author the expression $(f(x + h) - f(x))/h$.
- Highlight the entire numerator and click the **Simplify** button (= button).
- Highlight the entire numerator of the result and factor it with **Simplify|Factor** (be sure both h and x are highlighted before factoring).
- Highlight the entire quotient and **Simplify** (= button).

Exercise 3: Repeat steps for 4a-4d for g instead of f where $g(x) = \frac{1}{3x}$ (in 'Derivese' $g(x) := 1/x^3$).

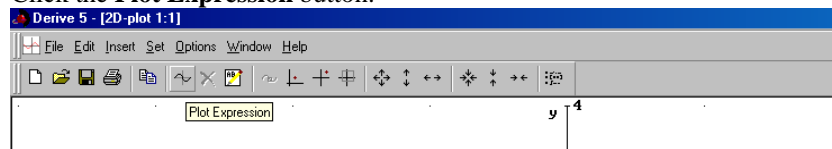
Graphics:

What we've been doing up to now is the algebra end of calculus. DERIVE for Windows is probably more useful from the graphics end of things. Let's do some graphs. First, delete the current slate of expressions.

- Author the expression $x^3 - 3x$. Now, click the **2D-Plot** button.



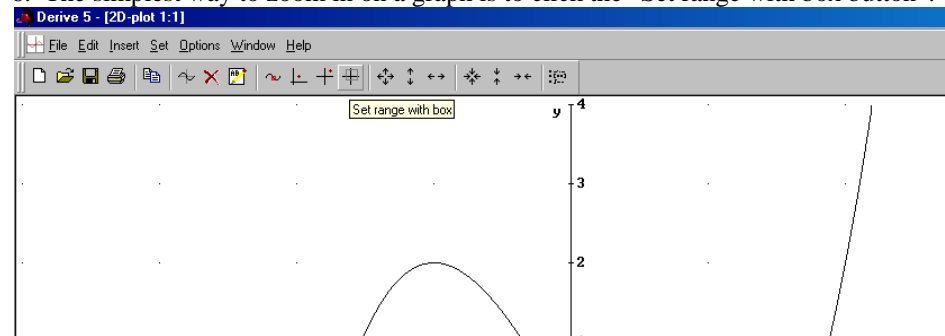
Click the **Plot Expression** button.



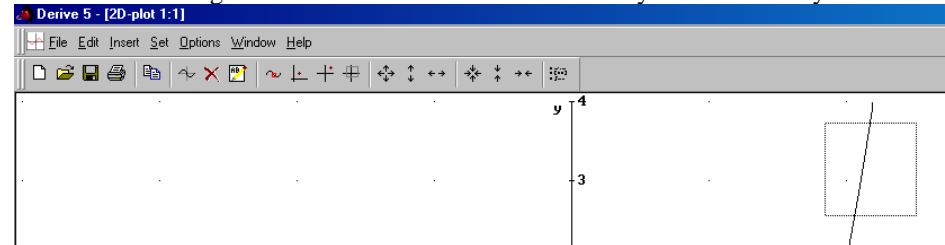
The graph will appear. You can delete it with the **Delete** button.

Somewhere on the screen you should see a small +. Below and to the left, the values of x and y are displayed. They correspond to the position of the +. To move the +, you may simply click on a spot on the graph or use the ARROW keys. See if you can use this method to discover the x coordinate of the right-most intersection of the graph with the x-axis.

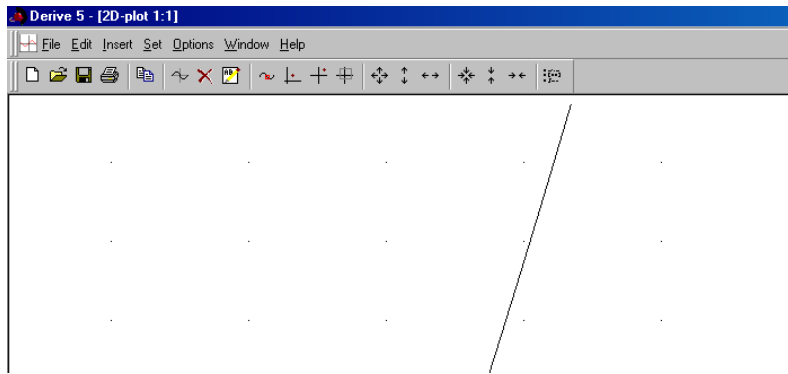
- The simplest way to zoom in on a graph is to click the "Set range with box button".



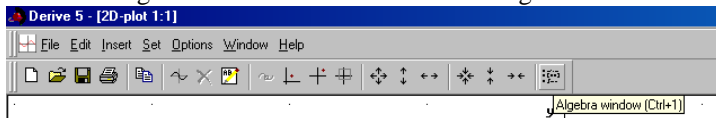
Then click and drag the "box" around the section of curve you wish to study.



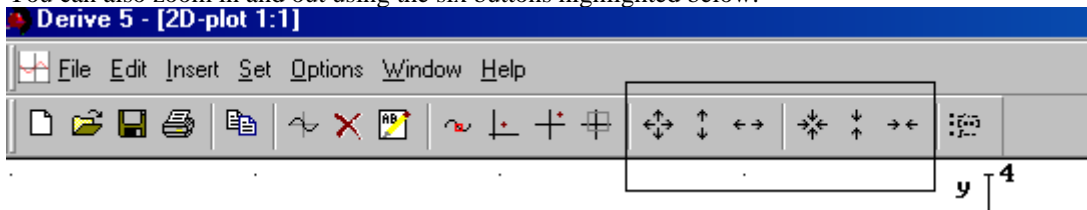
Finally, Click OK on the 2D range pop-up screen. The result is a full-sized plot of this smaller section of curve.



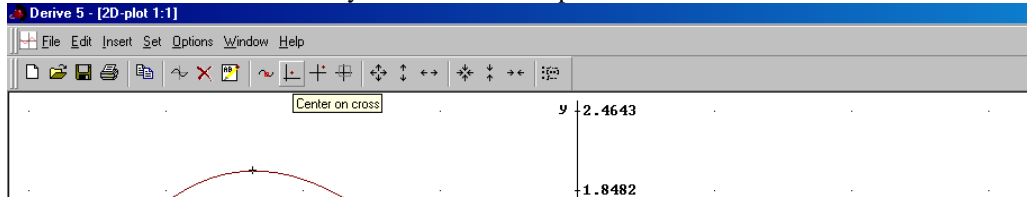
Click the Algebra Screen icon to return to the algebra screen



You can also zoom in and out using the six buttons highlighted below.



You first need to locate the + at your desired center point and click the “Center on cross” button.



Experiment with these keys.

Exercise 4. Graph the function $\sin(x)/x$. Copy what you see onto your paper. Zoom in on the graph at the point $(0,1)$. Again, copy what you see onto paper. Isn't $\sin(x)/x$ supposed to be undefined here at $x=0$? Comment on what you think is happening.

Exercise 5: Although I am not having you print your results, please be sure the printer in this lab is installed on your college user number. Instructions appear on the wall in several places. I can help you if you have trouble.

Turn in your labs to me.

Be sure to log off.