TI-82 Tutorial for MA113
Fall 1996
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- Getting to Know the TI82

  1. Turning it on and off.
     (a) The hardest part about turning it on is finding the $\boxed{\textbf{ON}}$ button. You will find it in the lower left hand corner of the machine.
     (b) Turning the calculator off is a bit trickier. Notice that the word off is written in blue just above the $\boxed{\textbf{ON}}$ button. In fact, as you look around the calculator, you should notice that almost all the buttons have something else written in blue above them. On the TI82 there are two or usually three meanings assigned to each button, much the same way as there are two letters asssigned to each key on your typewriter (upper and lower case, or numbers and special symbols). To access the blue commands press the light blue $\boxed{\textbf{2nd}}$ button (in the upper left hand corner), followed by the key that has the command you want. For example, to turn your calculator off you would press $\boxed{\textbf{2nd}}$ $\boxed{\textbf{ON}}$.
  2. The basic operations.
     (a) Suppose we want to compute a simple sum, say $43 + 25$. This can be entered in the usual fashion: press $\boxed{\textbf{4}}$ $\boxed{\textbf{3}}$ $\boxed{+}$ $\boxed{\textbf{2}}$ $\boxed{\textbf{5}}$. Notice that the expression

$$43 + 25$$

     appears on your screen, but nothing happens. To have the calculator actually evaluate the expression, press $\boxed{\textbf{ENTER}}$, which is in the bottom right hand corner of the machine. Your answer should now appear on next line of the display.
     (b) Other calculations involving the basic algebraic operations can be handled in exactly the same way. For example, try computing

$$\frac{3+4}{2} + \frac{24 \times 2 - 3}{4}.$$

     Notice that the use of parenthesis is essential here! (You will find the parenthesis directly above the numbers $\boxed{\textbf{8}}$ and $\boxed{\textbf{9}}$).
     (c) Suppose after computing the above expression, you realize that you had made an error. You really wanted to compute

$$\frac{3+4}{2} - \frac{24 \times 2 - 3}{4}.$$

     On other calculators you might be forced to re-enter the entire calculation, which would be very time consuming and iritating, especially for longer, more involved expressions. On the TI82 however, you can recall the last expression by pressing $\boxed{\textbf{2nd}}$ $\boxed{\textbf{ENTER}}$. Now use the arrow keys (in the upper right hand corner) to move the blinking cursor until it is over the offending + sign and hit the $\boxed{-}$ key, then the $\boxed{\textbf{ENTER}}$ key. The new calculation is performed without having to re-enter the entire expression.
     (d) Now our screen is all full of junk. Before we move on to anything else, it would be nice to clear the screen. To do this, simply press the $\boxed{\textbf{CLEAR}}$ button, which in under the movement arrows.

3. Advanced Operations
   (a) Many functions such as sin, cos, and log work exactly like you think they do. Simply hit the key coresponding to the function and then the number you wish to evalutate. For exampe $\sin 1$ can be evaluated by typing **SIN** **1** **ENTER**. Note that this operation was performed using radian measure.
   (b) Some functions such as arcsin, arccos, or exponentiation base e work exactly as above, except you need to hit the **2nd** key to activate the function. For example 10^4 can be evaluated by pressing **2nd** **LOG** **4** **ENTER**.

- Graphing Functions Using the TI82.

1. Graphing a single function.
   (a) First, make sure you are in the correct mode. Press the **MODE** button. Check and make sure the following fields are highlighted:

      Normal
      Float
      Radian
      Func
      Connected
      Sequential
      FullScreen

      If not, use the arrow buttons to move the blinking cursor to the field that needs to be highlighted, and press **ENTER** . Now, we're ready to graph!
   (b) We are going to graph the function

$$y = x^3 - 6x^2 + 12x - 5.$$

   (c) Press the button **Y =** .
   (d) At the blinking cursor, enter

$$X\hat{\ }3 - 6X\hat{\ }2 + 12X - 5$$

      (Hint: to enter the variable X, press the button **X,T, θ**).
   (e) Now we need to specify the size of our viewing window. Press the button **WINDOW** . Using the downward arrow button, position the blinking cursor so that it is to the right of Xmin, and enter the number -5. (Hint: Whenever you want a negative sign (as opposed to a subtraction symbol), press the **(-)** button on the bottom right of the calculator). In a similar matter, change the following values:

      Xmin = -5
      Xmax = 5
      Xscl = 1
      Ymin = -5
      Ymax = 5
      Yscl = 1

      Now, press the button **GRAPH**.

(f) Hmmm...that doesn't look so good. Try experimenting with various windows until you find one that you like. (Press **WINDOW** and follow the above steps). Here is one of our favorites:

Xmin = 0
Xmax = 4
Xscl = 1
Ymin = -4
Ymax = 8
Yscl = 1

Let's call this window setting the "home setting." You will frequently be asked to return to the home setting, meaning that you will need to reset the fields to those listed above.

(g) With a graph of the function on the screen, press the **TRACE** button. A blinking x will appear at a point on the curve, and its (x, y) coordinates will appear at the bottom of the screen. Pressing the left and right arrow buttons causes the calculator to "trace" the curve.

2. Graphing multiple functions.

(a) Press the button **Y =** .

(b) The first line should read

$$Y_1 = X\hat{}3 - 6X\hat{}2 + 12X - 5.$$

(c) Use your downward arrow button to position the blinking cursor to the right of $Y_2 =$. Enter the following function:

$$(X - 3)\hat{}2.$$

(d) Reset your window setting to the home setting if necessary. (Press **WINDOW** to get to the window screen). Now press **GRAPH** . WOW - both graphs appear! But maybe you are only interested in looking at the second graph. That's easy to correct. Press the button **Y=** , and position the blinking cursor directly on top of the = sign in the first expression. Press **ENTER** . You have de-selected the function Y_1. Now, press **GRAPH** , and see what happens.

(e) Actually, for the next application, you will need both graphs, so you need to re-select Y_1. Press the **Y=** button, position the cursor over the first = sign, and press **ENTER** .

3. Finding intersection points: Using the ZOOM feature.

(a) Our next goal is to estimate where the graphs of the functions

$$y = x^3 - 6x^2 + 12x - 5$$
$$y = (x - 3)^2$$

intersect.

(b) Press **ZOOM** . The top line of the zoom screen has two fields

ZOOM MEMORY

Press the right arrow button to select MEMORY. Enter 4 to select the field SetFactors. You want to set

XFact = 10
YFact = 10 .

Once those are set, press $\boxed{\textbf{GRAPH}}$ to view both curves.

(c) With both graphs displayed on the screen, press the $\boxed{\textbf{TRACE}}$ button. Using the arrow buttons, position the blinking x so that it appears near an intersection point of the graphs. Press the $\boxed{\textbf{ZOOM}}$ button, and enter 2 to select Zoom In. You will return to the screen displaying the graphs. Press $\boxed{\textbf{ENTER}}$, and see what happens. Repeat these steps to zoom in further on the intersection point. Use the values of x and y that appear at the bottom of the screen to estimate the intersection point.

(d) Wow, that was a lot of work! Fortunately, the calculator has a built-in feature that makes computing intersection points much easier. Reset the size of the viewing window to the home setting. Having done that, press $\boxed{\textbf{CALC}}$. Hint: You actually need to press the sequence of buttons $\boxed{\textbf{2nd}}$ $\boxed{\textbf{TRACE}}$. Enter 5 for "intersect." The graphs will re-appear, along with the prompt "First curve?" Using the arrow buttons, move the cursor to a point on one of the curves, and press $\boxed{\textbf{ENTER}}$. Now you will see the prompt "Second Curve?" Move the cursor to a point on the other curve, and press $\boxed{\textbf{ENTER}}$. Finally, you will be given the prompt "Guess?" Move your cursor as close to the point of intersection as you can, and press $\boxed{\textbf{ENTER}}$. After thinking for a few moments, the calculator will produce the coordinates of the point of intersection. How do these values compare with your estimate?

4. Graphing parametric equations (an advanced application)

(a) Your calculator has the capability of graphing parametric equations. The first thing you need to do is change the mode to "parametric." This is achieved by pressing $\boxed{\textbf{MODE}}$, then selecting the option "Par" in the fourth line on the screen. Do this by moving the cursor using the arrow keys. When number 4 is highlighted, press $\boxed{\textbf{ENTER}}$

(b) Let's do a simple example. Press the $\boxed{\textbf{Y=}}$ button. The screen looks a bit differently now! Next to the X_{1t}, enter T. (Hint: press the $\boxed{\textbf{X,T,}\theta}$ button. Now you know why there is "T" on that button - do you know what the θ is used for?) Next to the Y_{1t}, enter T^2. Press $\boxed{\textbf{WINDOW}}$, and use the following settings:

Tmin = -5
Tmax = 5
Tstep = 1
Xmin = -5
Xmax = 5
Xscl = 1
Ymin = 0
Ymax = 25
Yscl = 5 .

Now press $\boxed{\textbf{GRAPH}}$.

(c) Experiment with TRACE and ZOOM.

Good Luck and Happy Computing!!