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The use of graphing calculators in Math 151-152 this year

The TI-82 is in the midrange of currently available graphing calculators in terms of memory and built-in functions. While reading what follows, please remember:

Our goal is to teach calculus, not how to use a calculator!

The TI-82 is actually much more resembles a small portable computer than it does a five-function ($+$, $-$, $\times$, $\div$, $\sqrt{\ }$) calculator. Although the lecturers in this course may differ in how much they will teach with the calculator, it is likely that only a small portion of the capabilities of the TI-82 will be used. Anyone browsing through the manual supplied with it will see more applications. Here's what you should be able to do entering Math 152 with the TI-82:

- You should know how to use it as a sophisticated scientific calculator. So you should be able to compute $\tan\left(2^{\ln(5.7)}\right)$ immediately (I get .2025419661). In this course be **sure** that your calculator is in `Radian` mode and **not** in `Degree` mode. This is very important!
- The TI-82 can store formulas for functions. You should know how to enter formulas. Pressing the `Y=` key yields a whole bunch (10) of places to enter formulas. Formulas can be entered which are logically and computationally quite complex. If I enter $\mathtt{Y}_1$ $= \mathtt{X}^2$ and then create $\mathtt{Y}_1\mathtt{(8)}$ with some key presses, the magic answer `64` will appear. More complex functions can be similarly stored and worked with.
- You should know how to graph functions. One or more functions can be graphed by pressing the `GRAPH` key. You should also be familiar with using the `WINDOW` key to specify the region you wish to graph. The `ZOOM` key allows you to change the window in several ways. It is used most often to "zoom in" on a part of a picture. The `TRACE` key can be useful to approximately locate interesting points on curves, such as where they intersect. Can you approximate the intersections of $y = \sin x$ and $y = 1 - x^2$?

You will probably find the calculator useful when we get to such topics as numerical approximation techniques for definite integrals and limits of sequences and series. Here are a few other TI-82 capabilities which might be useful in Math 151-152 but which are *not* necessary:

- There are a whole range of built-in functions (actually, quite sophisticated programs) "hidden" under the `MATH` key. You may want to experiment with some of them, such as root finding. There are various ways of enhancing graphs, including shading certain areas. You can also create tables of function values, which is sometimes useful for studying limits.

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- The TI-82 can be programmed like a computer. Below is a program for Newton's method which I showed my class last semester.

  ```
  PROGRAM:NEWT
  :Input X
  :For(A,1,5,1)
  :X-Y1/Y2→X
  :Disp X,A
  :Pause
  :End
  :Stop
  ```

  The program is typed into the calculator by beginning with the `PRGM` key followed by the choice of `NEW`. You can read the manual for more information. The program can then be used by pressing the `PRGM` key followed by `EXEC` (execute). Newton's method searches for a root of a function by "recyling" its previous guess, hopefully getting closer with each successive iteration or repetition. This program assumes that a formula for the function is stored in Y_1 and that a formula for the derivative of the function is stored in Y_2. The program requests an initial guess for the root, and then displays five successive iterations of Newton's method. The calculator pauses with each display so that the user can read the numbers because otherwise the displays flash by too quickly.

It may be tempting to spend too much time and effort with your graphing calculator. Please remember:

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