Chapter 1
Functions and Graphs

Section 1. Overview

This chapter is material preliminary to the study of calculus itself. For some it is review, for others, new material. For all it will be a different way of looking at and learning mathematics.

Objectives of Chapter 1

• To review some of the basic functions used throughout calculus: polynomials, rational functions, algebraic functions, trigonometric functions, and exponential functions.
• To learn the use of the computer program MicroCalc to study functions, particularly to graph functions and to experiment with functions.
• To learn about some basic attributes of functions, particularly their zeros and their extrema (maxima and minima).
• To learn how a computer looks at functions.

Starting MicroCalc

In this chapter, indeed in the whole book, you will use the MicroCalc software extensively. So your first order of business is to learn how to use it, beginning with starting it. But even before this, you should learn how to stop it! (How often have you started a new piece of software and not known how to “get out of it”?) Very easy with MicroCalc: wherever you are, just press <Esc> repeatedly until you are out.

To get into MicroCalc: First you must be logged into the directory where MicroCalc resides. Depending on which version you have, you type either

MC <Enter> or MC87 <Enter>

(no coprocessor, math coprocessor). Exit the logo screen by pressing <Space>. After the main menu appears, press <Enter> to choose the (highlighted) “Beginning Calculus”. Use the arrow keys to move around the ”Beginning Calculus”
menu to Help: Cursor, and read what is at the bottom of the screen. Then press <Enter> to read even more about moving the cursor.

Press <Space> to return to the “Beginning Calculus” menu, and do the same with the other two “Help” items. Read these help sections carefully; they contain all you need to use MicroCalc. Practice moving around the Beginning Calculus menu with

Home  PgUp  DnArrow  End  RightArrow etc.

Table of Values

Move around the “Beginning Calculus” menu until “Table of Values” is highlighted, and press <Enter>. You are prompted for a function: \( y = F(x) = \). Enter \( \sin x \) and press <Enter>.

Next you are prompted for an interval \([x_0, x_1]\). (In MicroCalc, \( x_0 \) is written \( x_0 \), etc.) You are prompted first for \( x_0 \), then for \( x_1 \). For \( x_0 \), just enter 0. Then for \( x_1 \) enter \( 2\pi \). To do this, look at the menu above the input area. You see that <Shift-F10> is the keypress for \( \pi \). So to enter \( 2\pi \), you first enter 2, then hold down <Shift> and press <F10>; finally press <Enter>.

At this point the function \( \sin x \) is going to be tabulated on the interval \([0, 2\pi]\). You are prompted for \( N \), the number of points of division of the interval. Key in 100 and press <Enter>. The first part of the table of values is shown, in two columns. If a printer is attached to your computer, press <Shift-PrtScr> to dump what is on the screen to the printer. (Printing graphics is not this simple!) To see more of the table, press <Space>, as prompted, and continue until the end of the table. Press <Space> again and a menu of choices for this module comes up. We always refer to a menu at this level as a module menu.

Function Editor

“Function Editor” is a utility for editing functions that have been entered previously or generated by other MicroCalc modules, and for defining functions to be used later. “Function Editor” is available from each module menu, also from main menus.

Choose “Function Editor” from the “Table of Values” module menu. When the Function Editor comes up, notice that the first saved function \( F_1 \) is \( \sin x \); all others are 0. Choose Define \( F_2 \) and key in \( 2 F_1 \). For the “\( F_1 \)” just use the corresponding “function” key. Press <Enter>; the saved function \( F_2 \) changes to \( 2\sin x \).

Try another experiment. Define \( F_2 \) to be

\[
2 \sin x + \cos x
\]