NUMERICAL METHODS PROGRAMS

I. About the Program Disk

The CD included with *Numerical Methods*, Third Edition by Faires and Burden contains a C, FORTRAN, Maple, *Mathematica*, MATLAB, and Pascal program for each of the methods presented in the book. Every program is illustrated with a sample problem or example that is closely correlated to the text. This permits each program to be run initially in the language of your choice to see the form of the input and output. The programs can then be modified for other problems by making minor changes. The form of the input and output are, as near as possible, the same in each of the programming systems. This was done to permit an instructor using the programs to discuss the programs generically, without regard to the particular programming system an individual student is using.

The programs are designed to run on a minimally configured PC. There are seven subdirectories on the disk, one for each of the computer languages and the seventh for data files. The data files have been constructed to work with any of the systems.

All of the programs are given as ASCII files. They can be altered using any editor or word processor that creates a standard ASCII file. These are also commonly called a "Text Only" file. To run the programs you must have the appropriate software.

For the C, FORTRAN, and Pascal programs, you can use a compiler under Windows since the programs follow recognized standards for the languages.

The Maple programs are presented as .TXT files and .MWS files. Within Maple you should open the .TXT file as a "maple txt" file. When presented with "text format choice" select "OK". The file will be loaded. You should then scroll to the top of the file and hit ENTER on the text portion of the

```
>Restart;
```

line. This will reinitialize Maple and move the cursor to the end of the first block below the

```
>Restart;
```

line. Move the cursor down to the first line that does not have the symbol #, indicating a comment line, in it. Hitting ENTER will compile the program and send the cursor to the bottom of the file. Hitting ENTER again causes the program to be executed.

Within *Mathematica*, open the file as a .TXT file. It will be imported as a single cell that is inactive. Select the cell by clicking on the blue line to the right of the code. Then go to the Cell option on the menu, click and then select Cell Properties. Make the cell active by clicking on Cell Active option. The one-cell program is now executable. To compile and run the program, place the cursor inside the text and press together Shift and Enter.

The MATLAB programs are presented as M-files that can be run from within MATLAB by entering their name without extension, for example, as BISECT21. The files should be placed in the MATLAB/BIN subdirectory of MATLAB.

During the execution of some of the programs you will be asked questions of the form

```
Has the function F been created in the program immediately
proceeding the INPUT procedure ?
```

To run the sample problems you should enter the response

`Y` (for Yes)

since the functions are embedded within the programs. The functions will need to be changed, however, if the programs are modified to solve other problems.

There is a slight exception in the case of the FORTRAN programs, since FORTRAN requires that any non-numeric input be enclosed in single back quotes. The response for FORTRAN program would consequently be

`'Y'` (for Yes)

Some of the programs require the input of large amounts of data or generate extensive output. To enable the programs to be run quickly and efficiently, the input data can be placed in data files and the data files read by the program. When the output is likely to be extensive, the programs have been constructed so that it is convenient to place the output directly into an output file. The program will prompt you for the form of the input and output you would like to use. For example, when running the program for Neville's method, `NEVLLE31.EXT`, using the defined data file `NEVLLE31.DTA` for the sample problem, you will first see a screen that states:

```
Choice of input method:
                        1. Input entry by entry from the keyboard
                        2. Input data from a text file
                        3. Generate data using a function F
                        Choose 1, 2, or 3 please
```

If you choose `1` you will need to enter all the data for the program from the keyboard, and any mistake in a data entry will require the program to be rerun.

Choosing

`3`

causes the program to ask if the function has been defined. If you answer

`Y` (for Yes)

the program will assume that the function has been defined in the program and will use that function to produce the required data. If you answer

`N` (for No)

the program will assume that you want to change the function before continuing and will terminate execution so that the correct function can be entered into the program. Once this has been done the program can be rerun. Since the Maple, *Mathematica* and MATLAB programs accept functional input, choosing

`3`

will cause a prompt for the input of the correct function.

II. Program Descriptions

Listed below by chapter are the descriptions of the individual programs. Since they are essentially language-independent, the program calls are listed with the extension .EXT. This should be replaced by the correct extension for the language you are using. These are

C	.C
FORTRAN	.FOR
Pascal	.PAS
Maple	.TXT, .MWS
Mathematica	.TXT
MATLAB	.M

Remember that if you are using FORTRAN, non-numeric input must always be enclosed in single left quotes.