

(Manual- Compman)
Quick Guide for Complex Variable Toolbox

1.1 Matlab version and computer requirements.

Complex Variable Toolbox (CVT) was developed with Matlab4.2, but it can also be used with Matlab5.0. However, some problems with positioning text and command identification have been detected when CVT is run with the late version.

The required system setting has a screen dimension of 640 by 480. If you try to run it with a different screen dimension, for instance, 800 by 600, there will be some distortion on the screen and also some difficulty in reading the text.

1.1.1 How to change the screen dimensions

The following instructions allow you to change the screen dimensions:

- (a) In Windows 95, click the "Start" button and a menu appears. Slide the mouse to click Settings, and a second menu appears. Slide the mouse to click Control Panel. A new screen comes up. Click the Display icon.
- (b) A screen called Display Properties comes up. Click on the "Settings" tab to move to that subsection.
- (c) At the Settings subsection, you will see a scroll bar with the title "desktop area". Then, move the bar to the left ("less") or right until you get the screen dimensions 640 by 480 pixels.
- (d) After this, press the "Apply" button. Then click OK.

1.1.2 How to install the CVT

To install the CVT:

- (a) Go to the Matlab folder. Open the Toolbox folder and insert a new folder that you should call "Complex".
- (b) Place all the CVT folders and files in the "Complex" folder.

1.1.3 How to set the path

For version Matlab4.2:

- (a) Go to the File pull-down menu and select Open M-file.
- (b) Open the file "matlabrc.m".
- (c) When you open the file, scroll down until you find:
matlabpath([...
'C:\MATLAB\toolbox\local',...
.....
.....
';C:\MATLAB\toolbox\matlab\demos',...
]);
- (d) Insert three new lines at the end of the path:
';C:\MATLAB\toolbox\Complex\Final',...
';C:\MATLAB\toolbox\Complex\Function',...
';C:\MATLAB\toolbox\Complex\Mappin',...
(e) Save and close the file.

1.2 Getting started; CVT and Matlab commands

Open Matlab program. At the Matlab prompt, type in *complex* and the CVT starting screen menu will come up.

1.2.1 Dot operations

When two arrays have the same dimensions the addition, subtraction, multiplication, and division operations are applied on an element-by-element basis.

For instance, given the arrays **a** = [1 2 3 4] and **b** = [2 3 4 5], to multiply them you have to use a slightly unconventional notation:

```
>> a .* b
```

This produces the multiplication of **a** by **b**, element by element,

```
ans = 2 6 12 20
```

This operation of multiplying element-by-element is invoked in MATLAB by using the **dot multiplication** symbol (.*). Similarly, division and raising to power require the **dot division** symbol (./) and the **dot power** symbol (.^).

1.2.3 Zoom command

In the "function" and "mapping" parts of this program, you can press the **Zoom button** to activate the zoom command. Then, place the mouse pointer in the Figure window. In general, by clicking the left mouse button you will expand the plot by a factor of 2, centering on the point under the pointer. Each time you click, the plot expands.

You can also click-and-drag to zoom into the specific area enclosed by your rectangle. In fact the rectangle should be *square*, in order to avoid deforming the region.

By clicking the right mouse button you can zoom out ("dezoom") by a factor of 2. You may repeat this until the figure reaches its original size. To deactivate the zoom command in this program, press the Zoom button one more time.

1.2.4 The ginput function

In MATLAB, "ginput" allows you to fetch coordinate points from a plot or subplot in a Figure window. In the "function" and "mapping" parts of CVT, press the **Points button** to activate this function. Then place the pointer mouse on each chosen point and click the left mouse button. Each coordinate will be input into the program.

1.2.5 Complex Data

Entering complex numbers from the keyboard has to be done carefully. The symbol "i" identifies the imaginary part and has to be typed immediately after the *numerical* value of the imaginary part: for example, $2 + 3i$. If you insert a space - for instance, $2 + 3 i$ - it *looks* like the same expression but it will be processed as a number ($2 + 3$) and a string (i), and not as the complex number ($2 + 3i$).

It is also important to point out that termination with the character i only works with simple numbers, not expressions. For example, the expression ($1 - 2i$)i has no meaning to MATLAB. If you want to multiply a complex expression by i, you have to use the multiplication operation symbol (*). In the example above, you must write ($1 - 2i$) * i . Similarly, the number $1 - \sin(2)i$ has no meaning for MATLAB. It has to be written as $1 - \sin(2) * i$ to make sense to the program.