Matlab

William R Carson

Building on the presentation by Francisco Monteiro

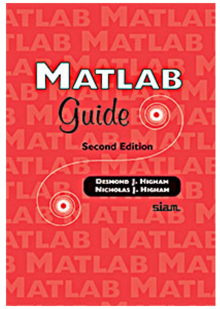
The product:

MATLAB® - The Language of Technical Computing

The company:

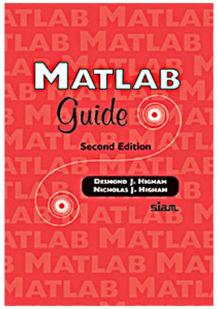
The MathWorks® - Accelerating the pace of engineering and science

Matlab



Year	Version	Notable Features
1978	Classic MATLAB	Original Fortran version
1984	MATLAB 1	Rewritten in C
1885	MATLAB 2	30% more commands and functions
1987	MATLAB 3	Colour and high resolution graphics printing
1992	MATLAB 4	Sparse matrixes, animations, debugger, windows support
1997	MATLAB 5	Profiler, object-oriented, multi-D arrays,
2000	MATLAB 6 (R12)	Desktop, PDE's, Java support
2002	MATLAB 6.5 (R13)	Performance acceleration, core algebra for Pent4
2004	MATLAB 7.0 (R14)	M-file to HTML, LaTex and others
2007	MATLAB 7.4 (R2007a)	Performance acceleration, more toolboxes
2007	MATLAB 7.4 (R2007b)	C code generation from Embedded MATLAB functions directly at the MATLAB command line

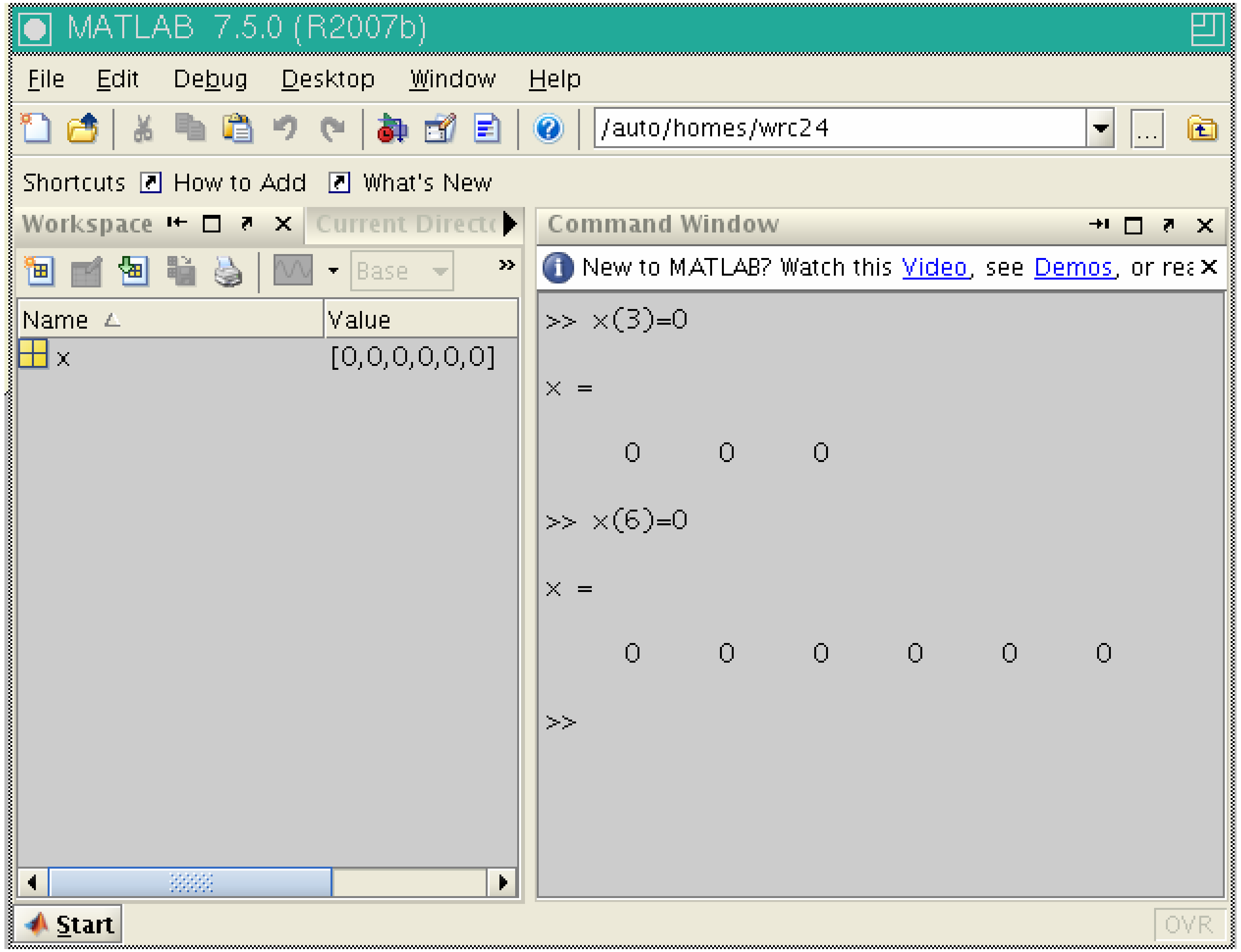
References



- MATLAB GUIDE by Higham and Higham
- Wikipedia
  - http://en.wikipedia.org/wiki/MATLAB
- The MathWorks
- Computing Service
  - http://www.cam.ac.uk/cs/courses/coursedesc/full.html#extmatlab

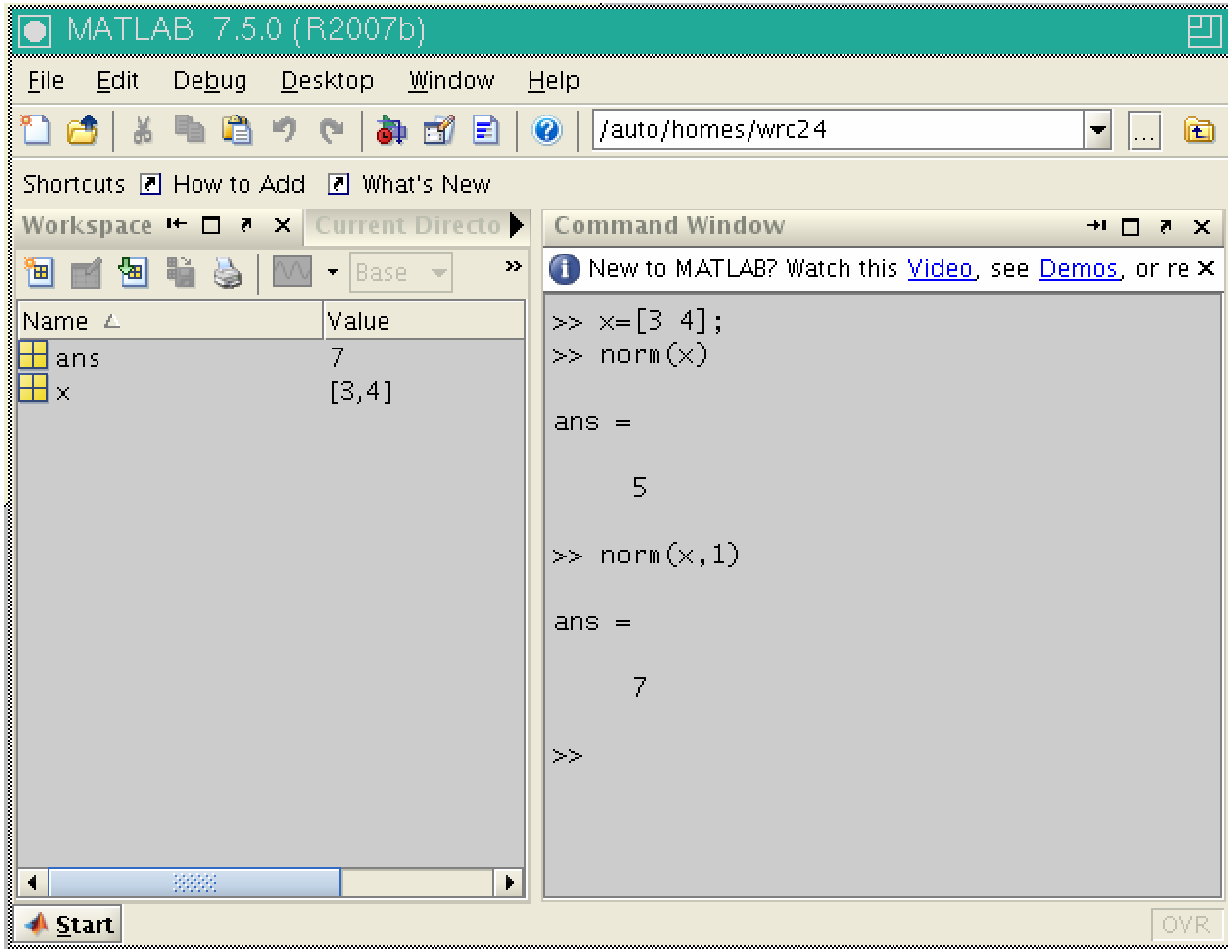
Distinctive features

1- Automatic Storage Allocation



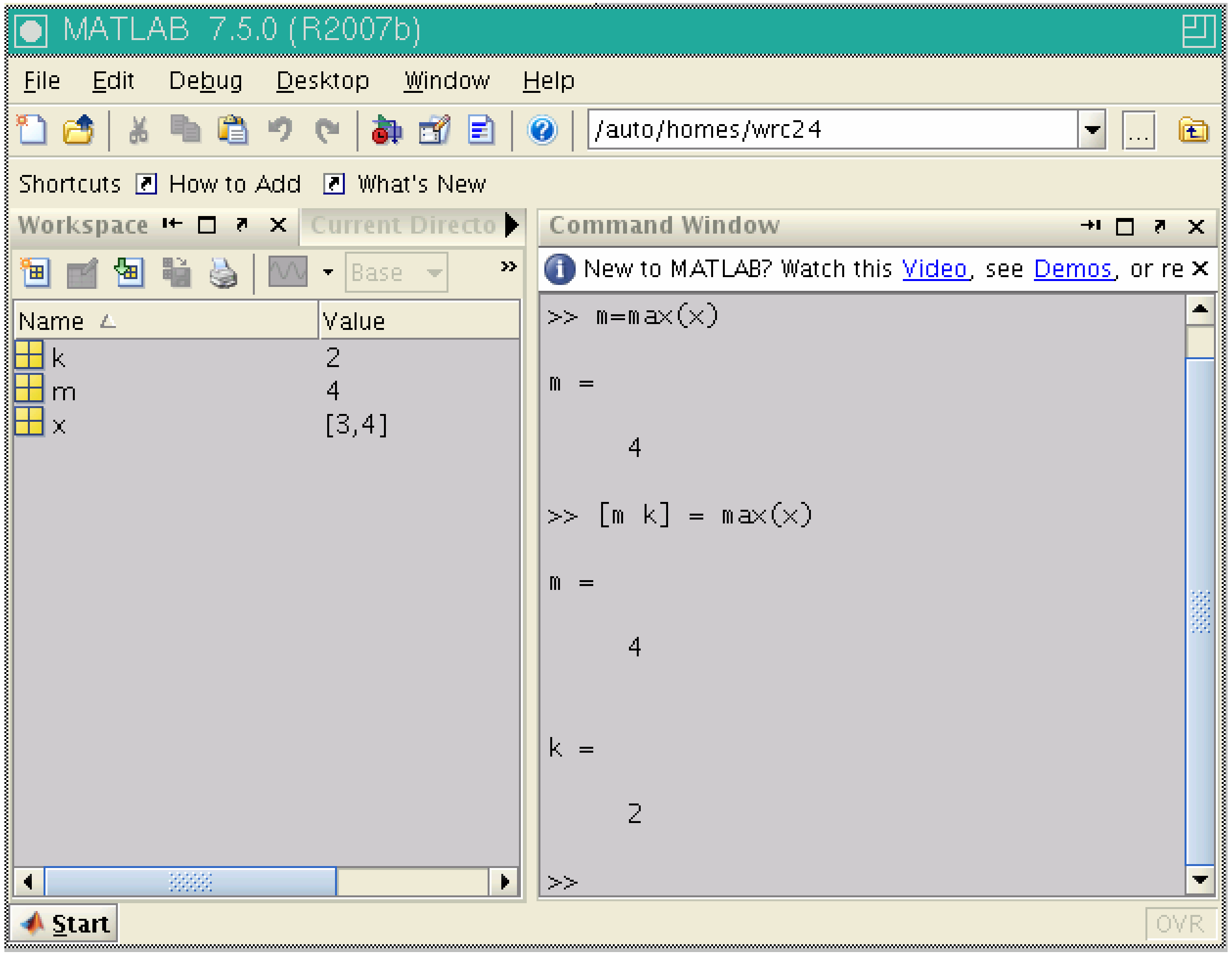
Distinctive features

2- Variable Arguments Lists



Distinctive features

2- Variable Arguments Lists



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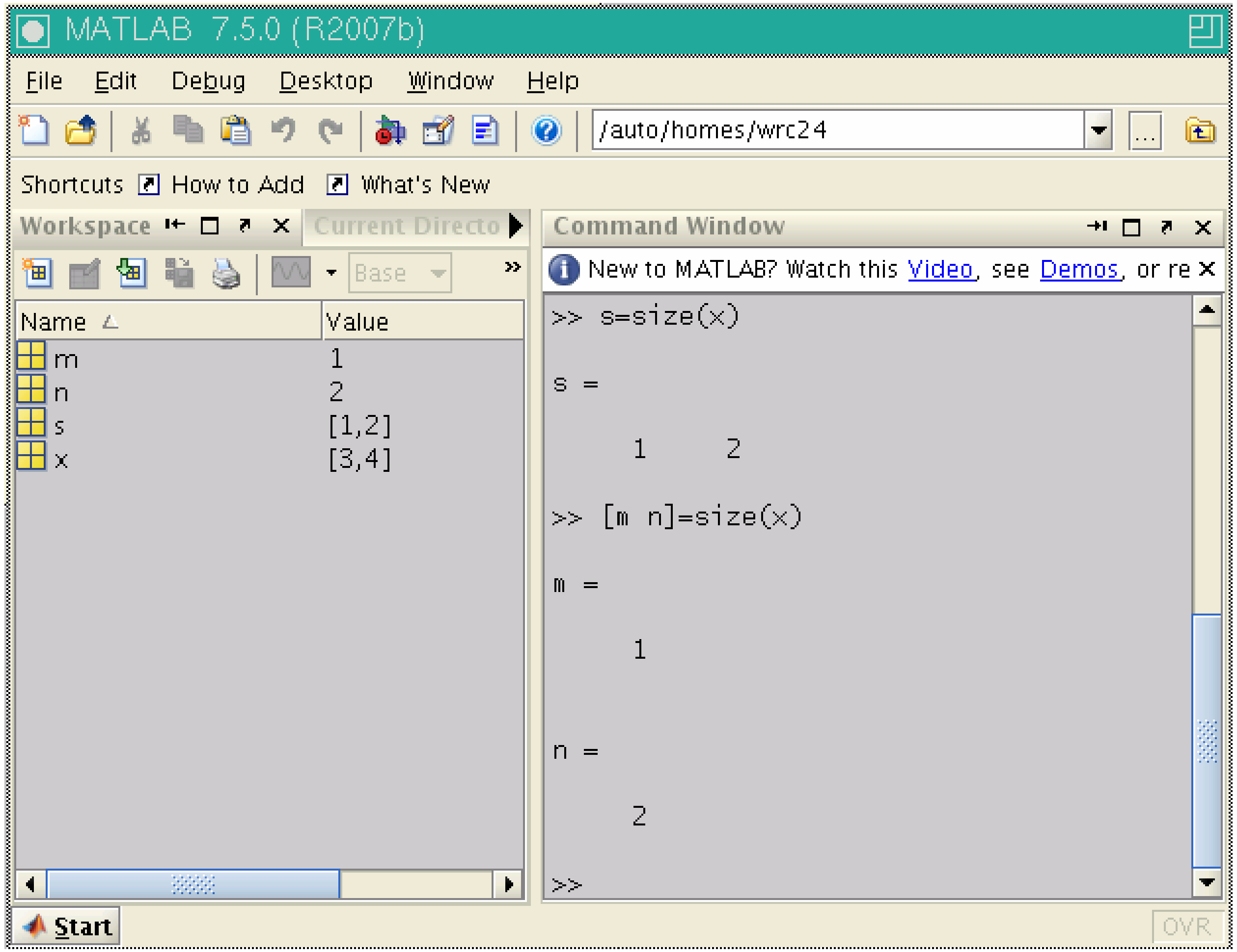
Distinctive features

2- Variable Arguments Lists



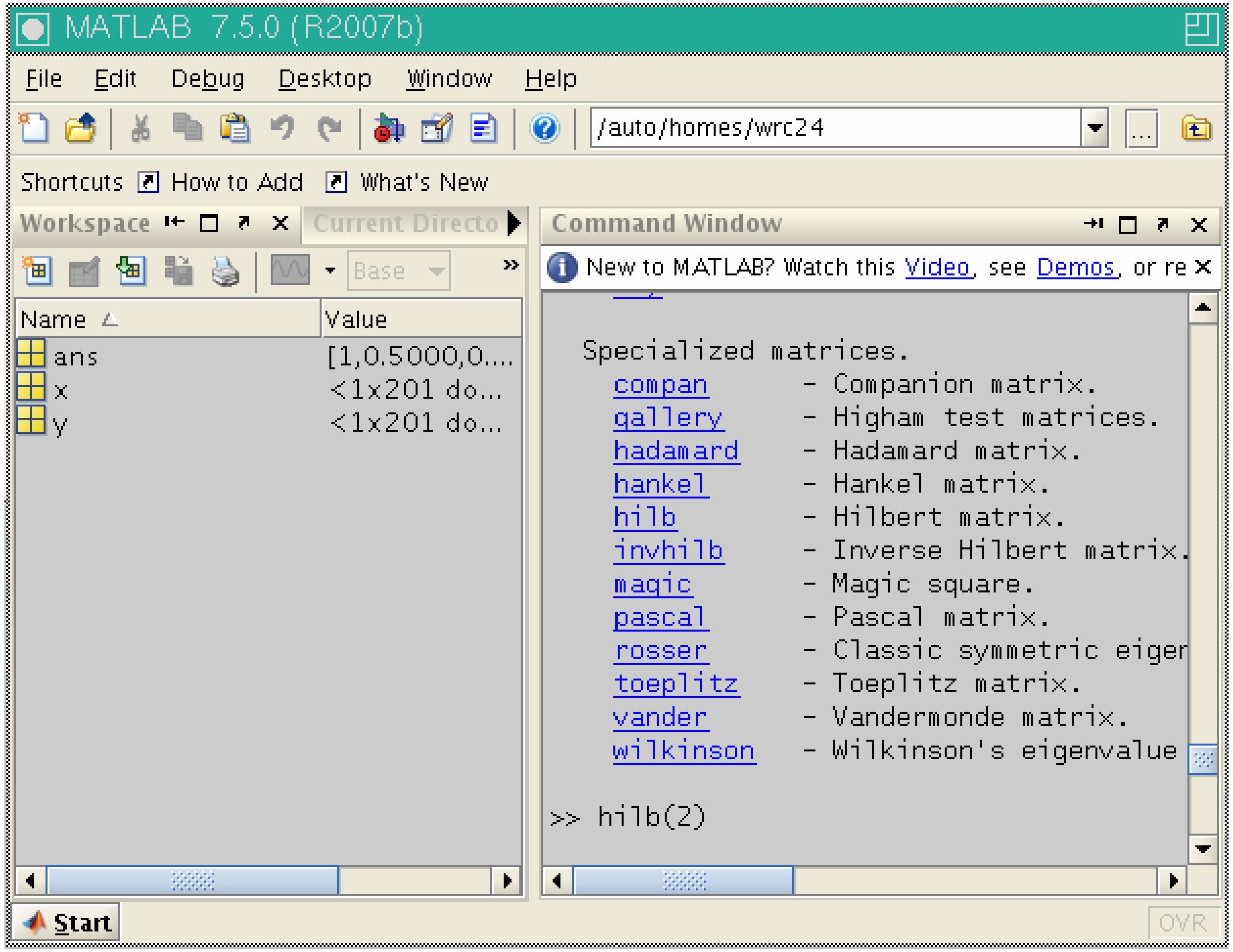
Distinctive features

3- Complex Arrays and Arithmetic

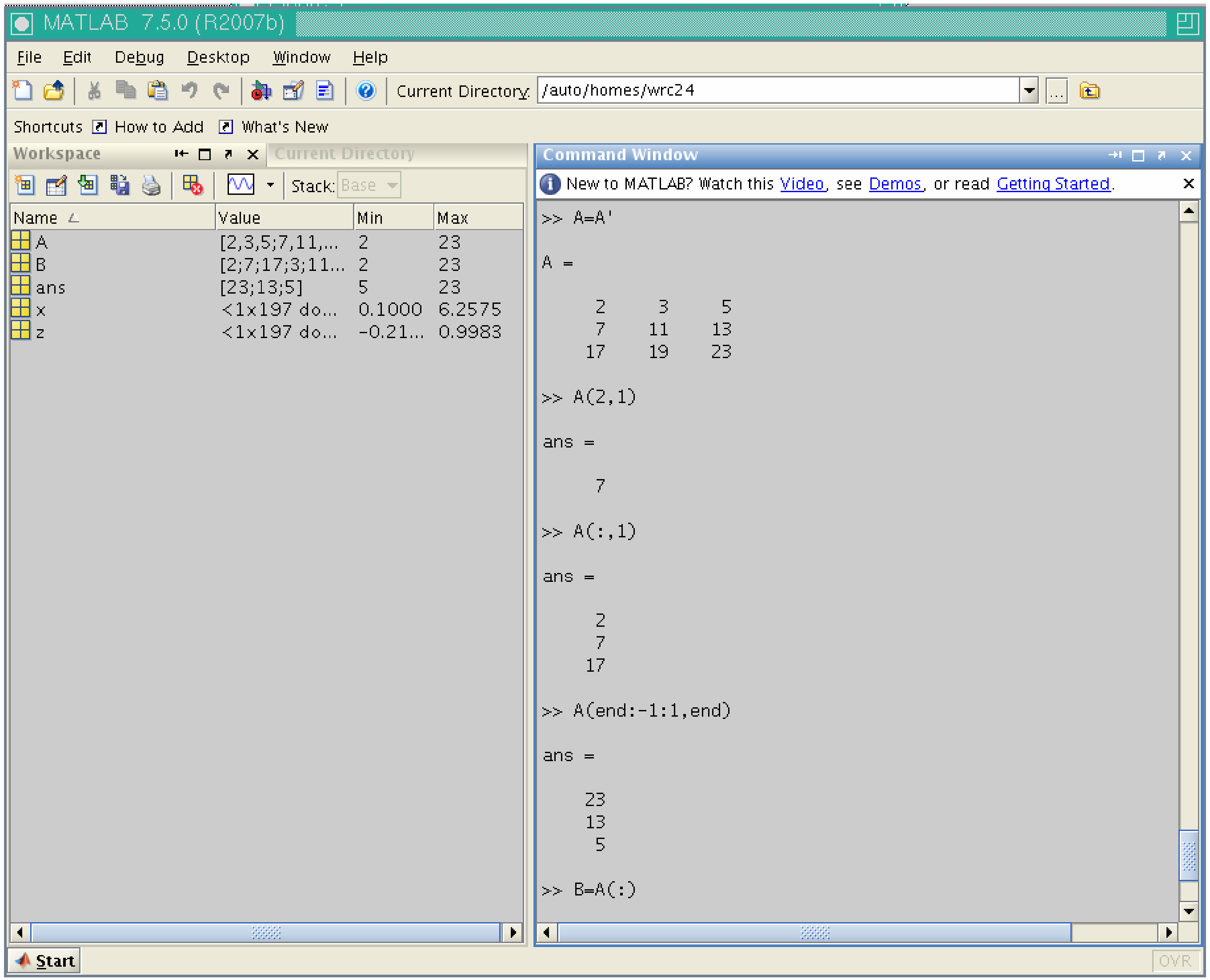
- The fundamental data type: a multidimensional array of complex numbers.
  - Fortran, two data types (real/imaginary)
  - C, C++, and Java only real
- Pitfalls
  - Redefining imaginary numbers
  - Max, min, sort for real and complex data

Matrices

- Generation
- Manipulation

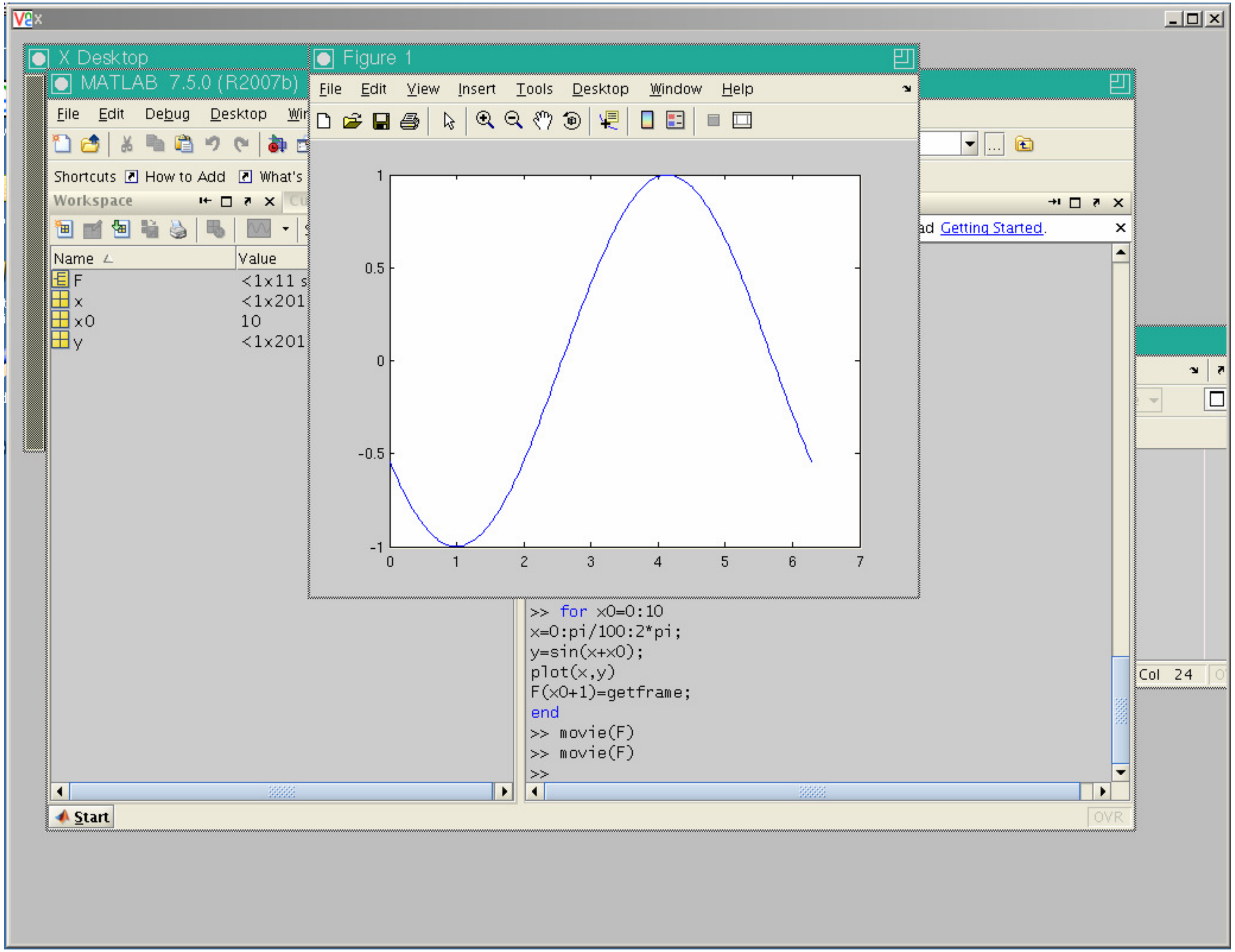


Matrices



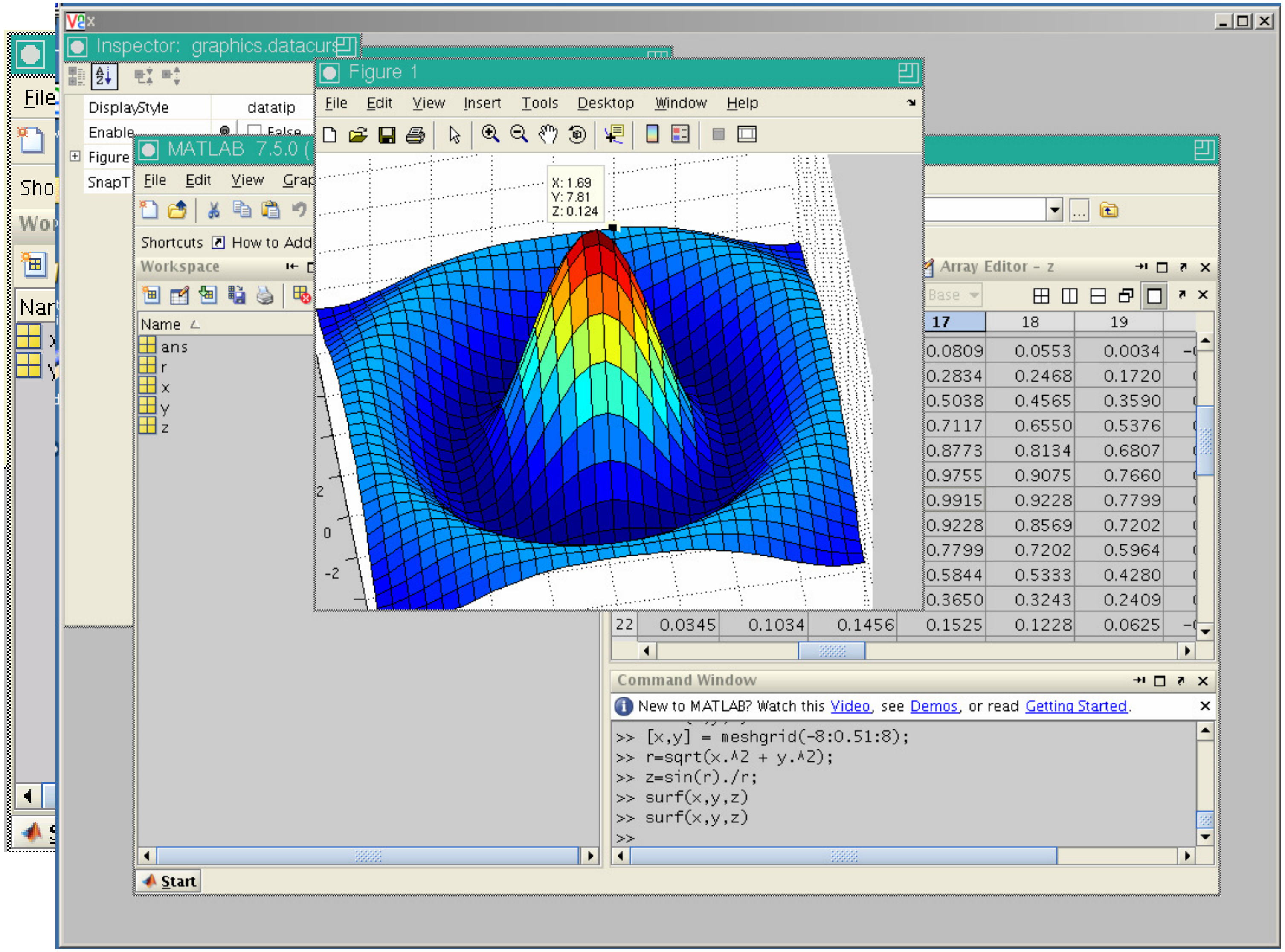
MATLAB 7.5.0 (R2007b)
File Edit Debug Desktop Window Help
Current Directory: /auto/homes/wrc24
Shortcuts How to Add What's New
Workspace
Current Directory
Stack: Base
Name Value Min Max
A [2,3,5;7,11,... 2 23
B [2;7;17;3;11... 2 23
ans [23;13;5] 5 23
x <1x197 do... 0.1000 6.2575
z <1x197 do... -0.21... 0.9983
Command Window
New to MATLAB? Watch this Video, see Demos, or read Getting Started.
>> A=A'
A =
2 3 5
7 11 13
17 19 23
>> A(2,1)
ans =
7
>> A(:,1)
ans =
2
7
17
>> A(end:-1:1,end)
ans =
23
13
5
>> B=A(:)
Start
OVR

Graphics

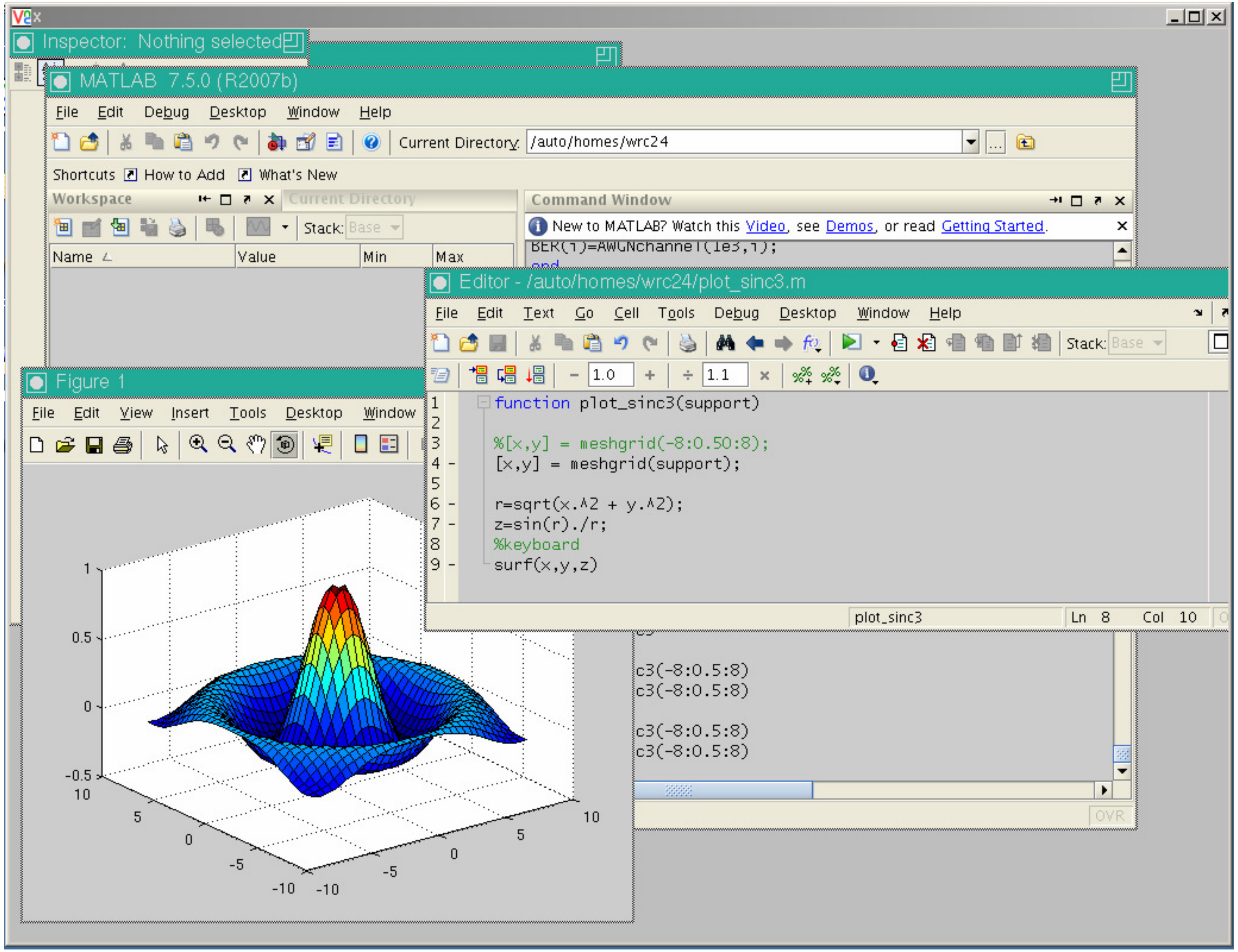


X Desktop
MATLAB 7.5.0 (R2007b)
Figure 1
File Edit View Insert Tools Desktop Window Help
Workspace
Name Value
F <1x11 s
x <1x201
x0 10
y <1x201
Getting Started
>> for x0=0:10
x=0:pi/100:2*pi;
y=sin(x+x0);
plot(x,y)
F(x0+1)=getframe;
end
>> movie(F)
>> movie(F)
>>
Start

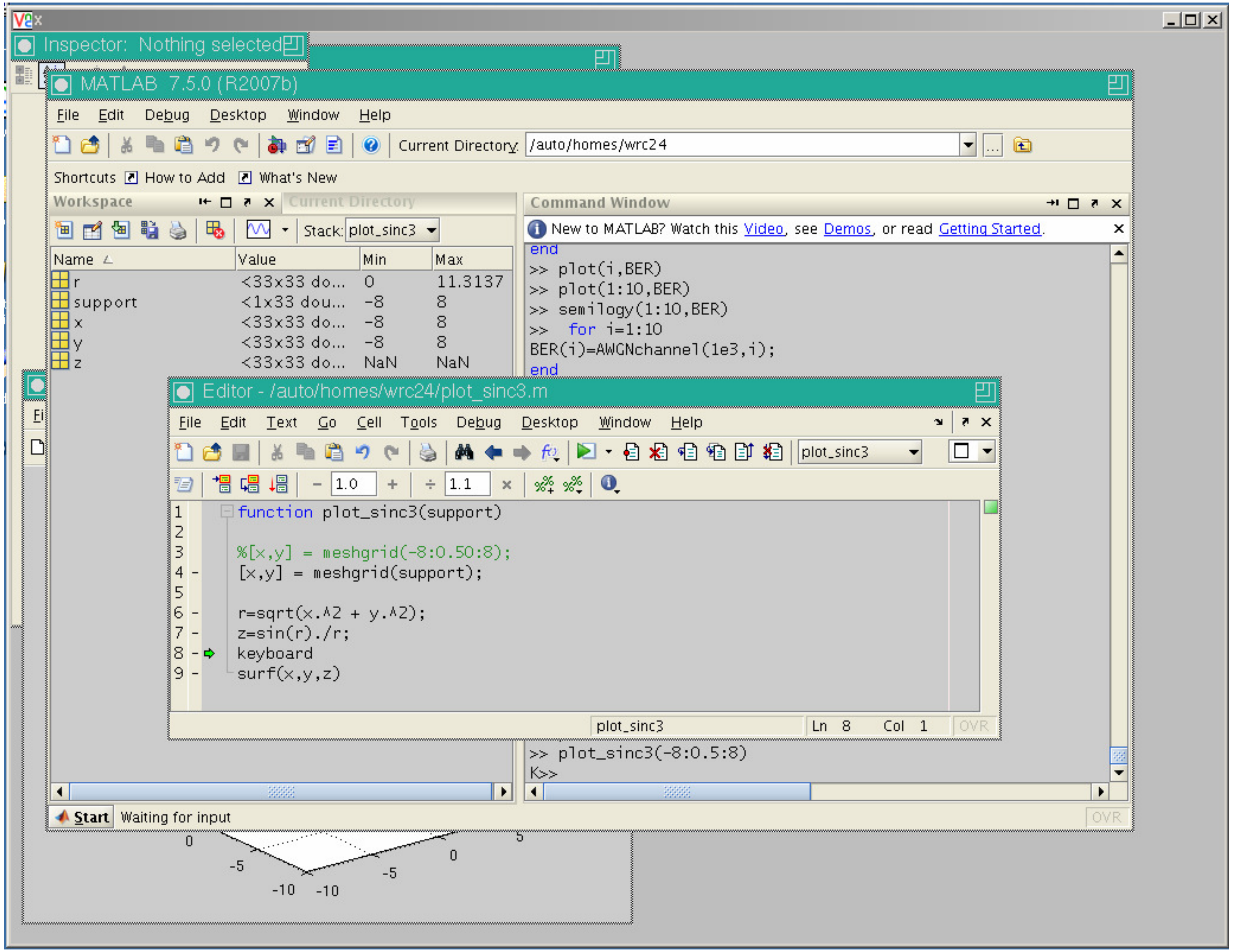
Graphics


Inspector: graphics.datacursor
Figure 1
File Edit View Insert Tools Desktop Window Help
X: 1.69
Y: 7.81
Z: 0.124
MATLAB 7.5.0
Shortcuts How to Add
Workspace
Name
ans
r
x
y
z
Array Editor - z
Command Window
New to MATLAB? Watch this Video, see Demos, or read Getting Started.
>> [x,y] = meshgrid(-8:0.51:8);
>> r=sqrt(x.^2 + y.^2);
>> z=sin(r)./r;
>> surf(x,y,z)
>> surf(x,y,z)
>>

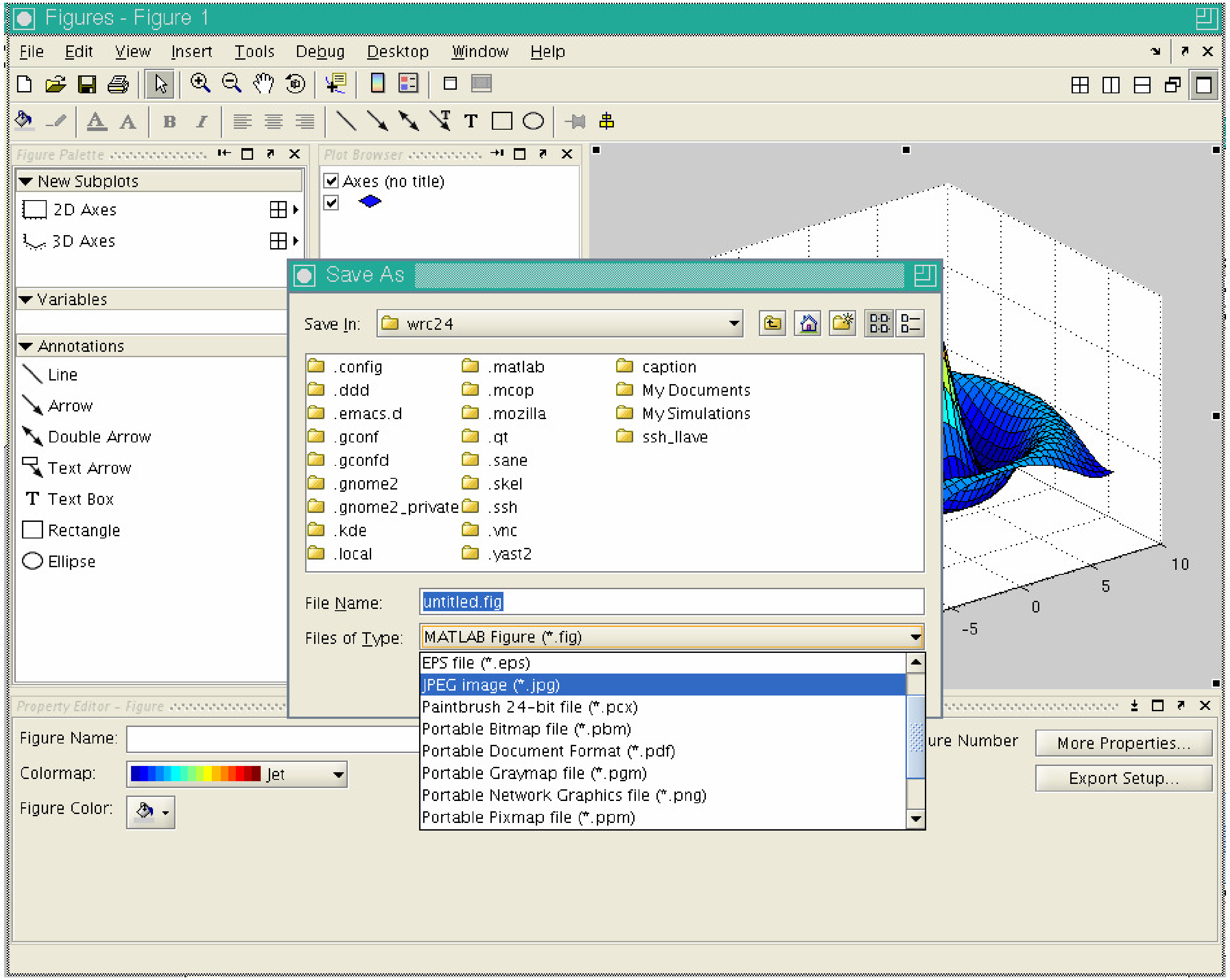
Writing m-files



Debugging m-files

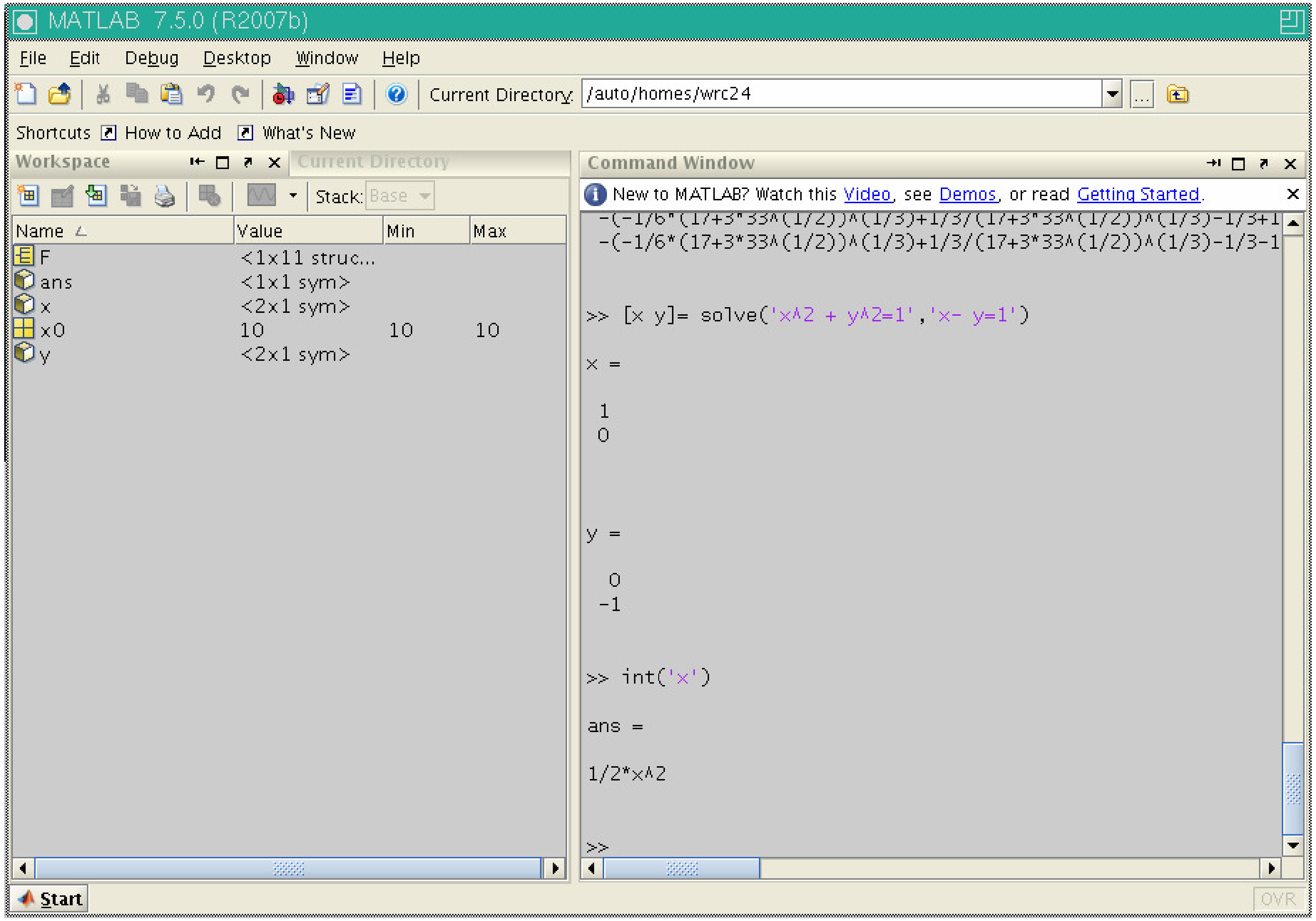


Saving graphics

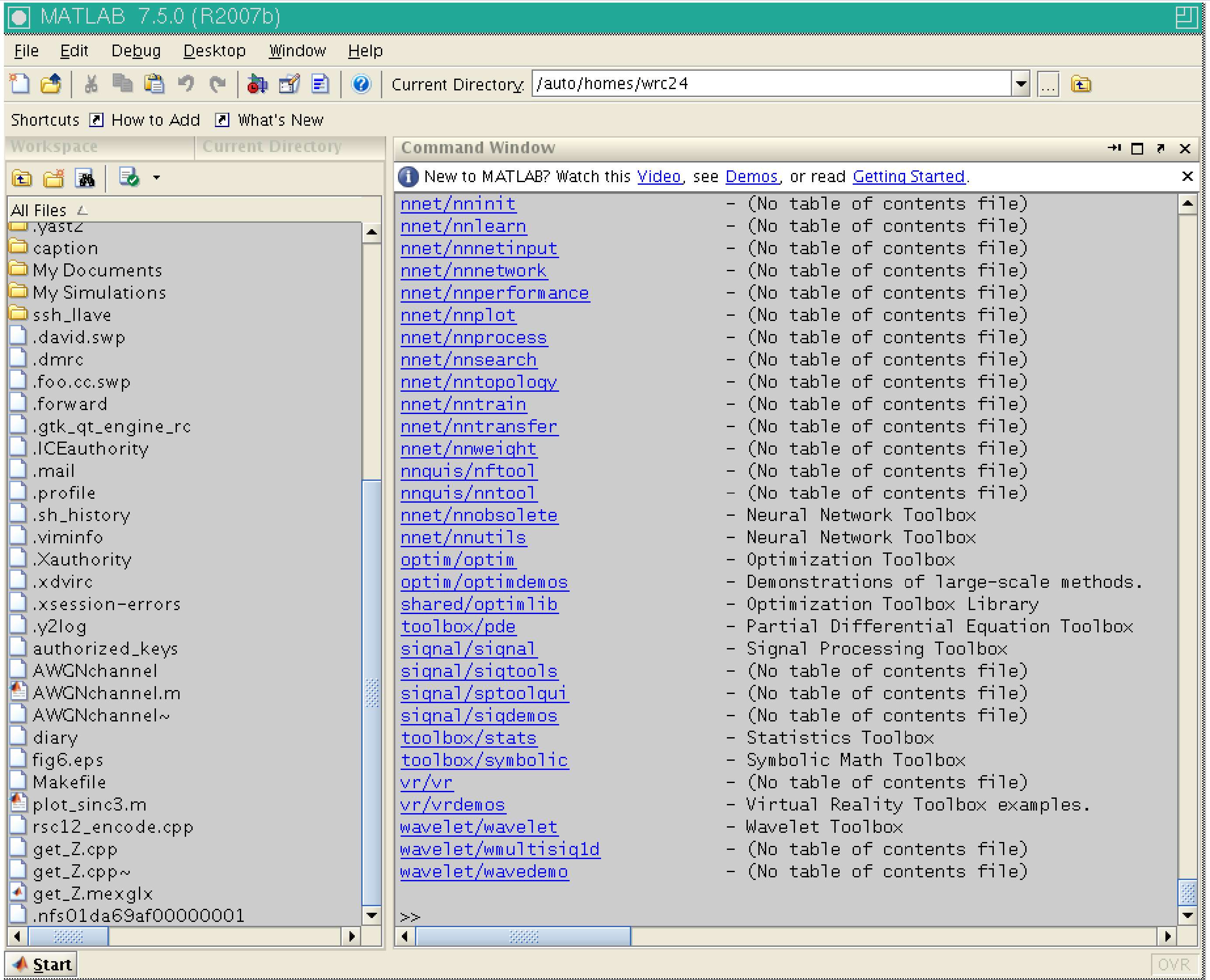


Built-in functions

- Help files
- Data analysis
- Equation solving



Toolboxes



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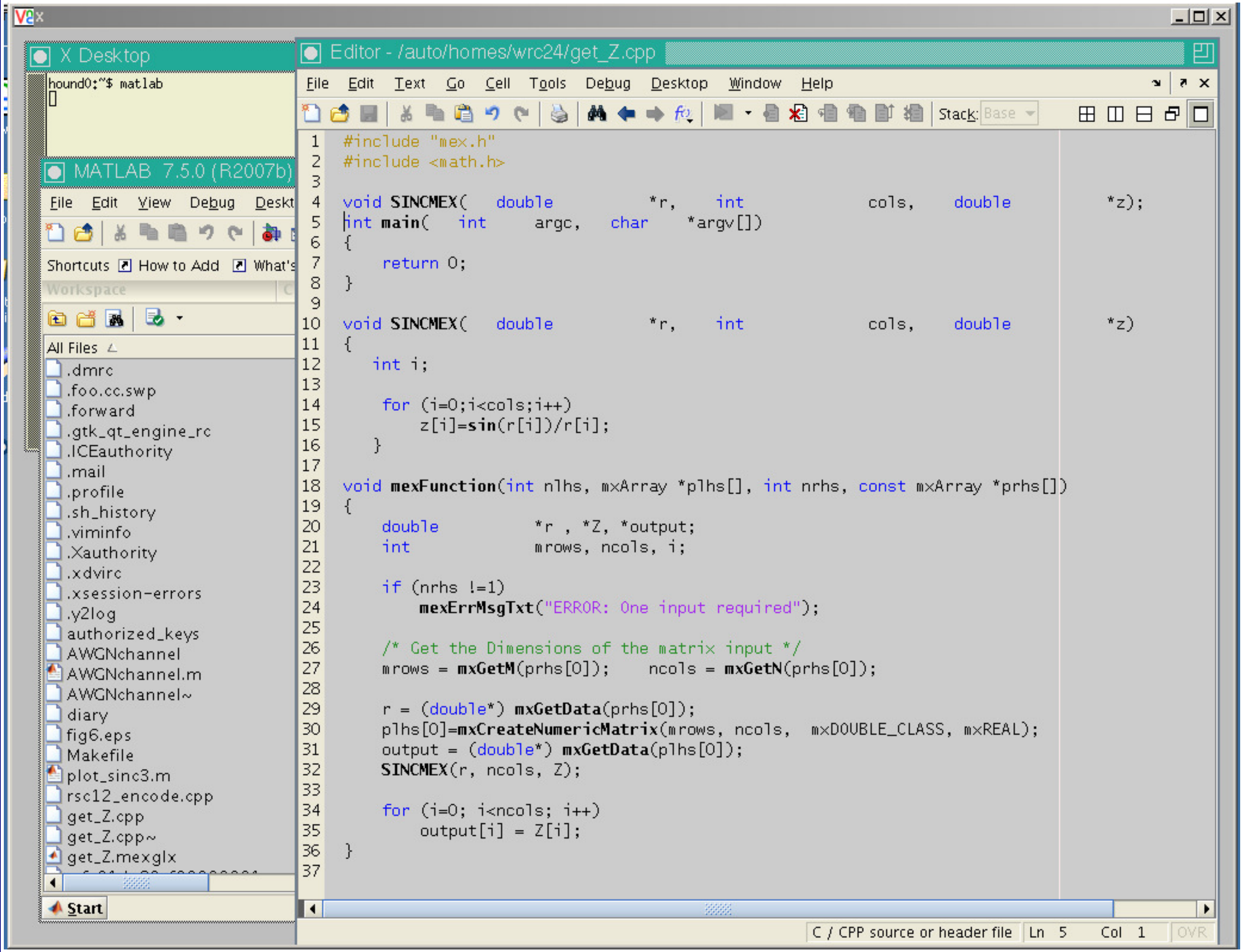
New to MATLAB? Watch this Video, see Demos, or read Getting Started.
All Files
.yast2
caption
My Documents
My Simulations
ssh_llave
.david.swp
.dmrc
.foo.cc.swp
.forward
.gtk_qt_engine_rc
.ICEauthority
.mail
.profile
.sh_history
.viminfo
.Xauthority
.xdvirc
.xsession-errors
.y2log
authorized_keys
AWGNchannel
AWGNchannel.m
AWGNchannel~
diary
fig6.eps
Makefile
plot_sinc3.m
rsc12_encode.cpp
get_Z.cpp
get_Z.cpp~
get_Z.mexglx
.nfs01da69af00000001
nnet/nninit - (No table of contents file)
nnet/nnlearn - (No table of contents file)
nnet/nnnetinput - (No table of contents file)
nnet/nnnetwork - (No table of contents file)
nnet/nnperformance - (No table of contents file)
nnet/nnplot - (No table of contents file)
nnet/nnprocess - (No table of contents file)
nnet/nnsearch - (No table of contents file)
nnet/nntopology - (No table of contents file)
nnet/nntrain - (No table of contents file)
nnet/nntransfer - (No table of contents file)
nnet/nnweight - (No table of contents file)
nnguis/nftool - (No table of contents file)
nnguis/nntool - (No table of contents file)
nnet/nnobsolete - Neural Network Toolbox
nnet/nnutils - Neural Network Toolbox
optim/optim - Optimization Toolbox
optim/optimdemos - Demonstrations of large-scale methods.
shared/optimlib - Optimization Toolbox Library
toolbox/pde - Partial Differential Equation Toolbox
signal/signal - Signal Processing Toolbox
signal/sigtools - (No table of contents file)
signal/sptoolgui - (No table of contents file)
signal/sigdemos - (No table of contents file)
toolbox/stats - Statistics Toolbox
toolbox/symbolic - Symbolic Math Toolbox
vr/vr - (No table of contents file)
vr/vrdemos - Virtual Reality Toolbox examples.
wavelet/wavelet - Wavelet Toolbox
wavelet/wmultisig1d - (No table of contents file)
wavelet/wavedemo - (No table of contents file)
>>
Start
OVR

External C and Fortran



- Called from MATLAB using MEX
- Requires a gateway routine
- Use as if regular function

Limitations

- Licenced product
- y = f(x) ambiguity
- Arrays initial index is 1
- No references