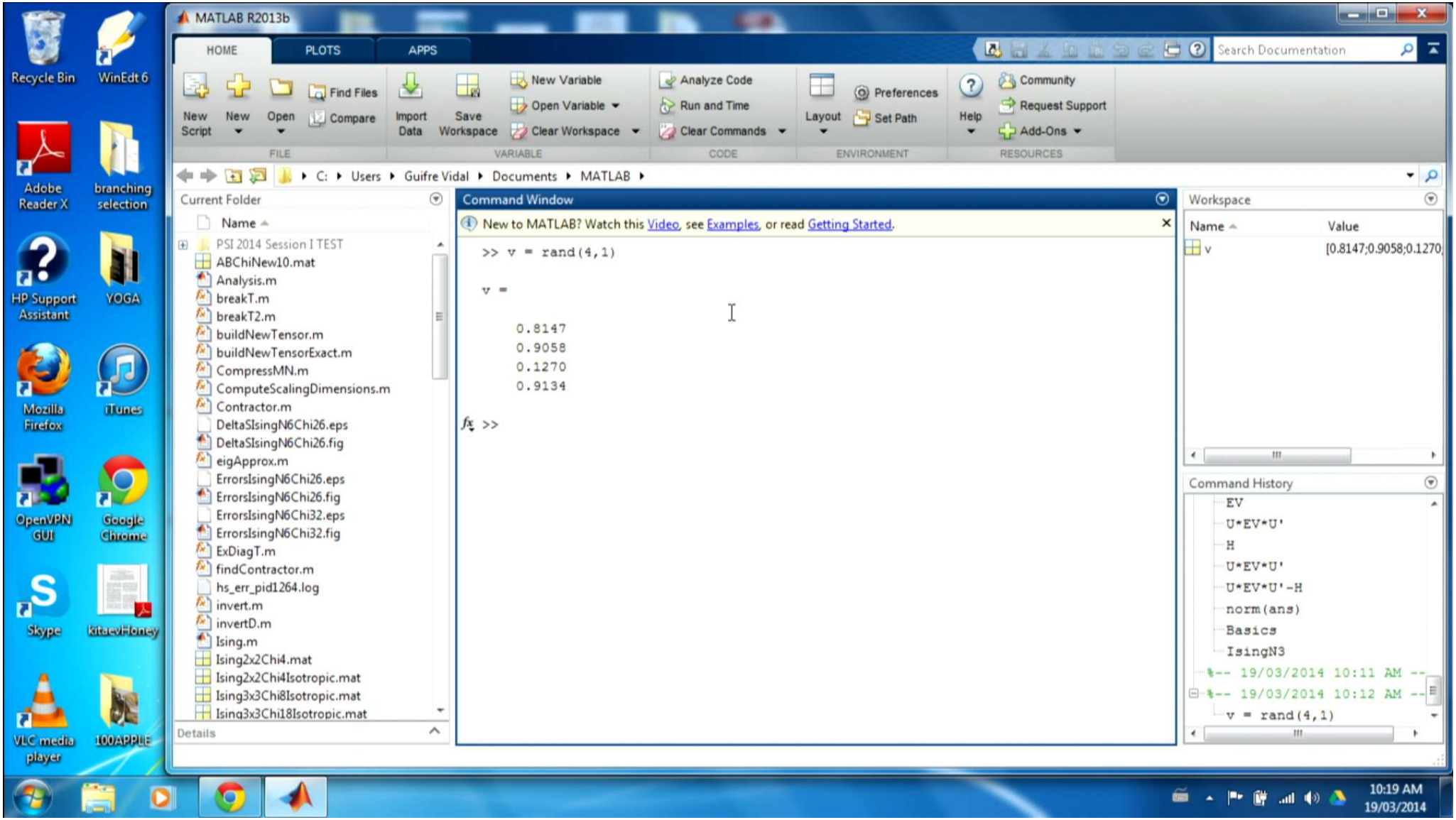
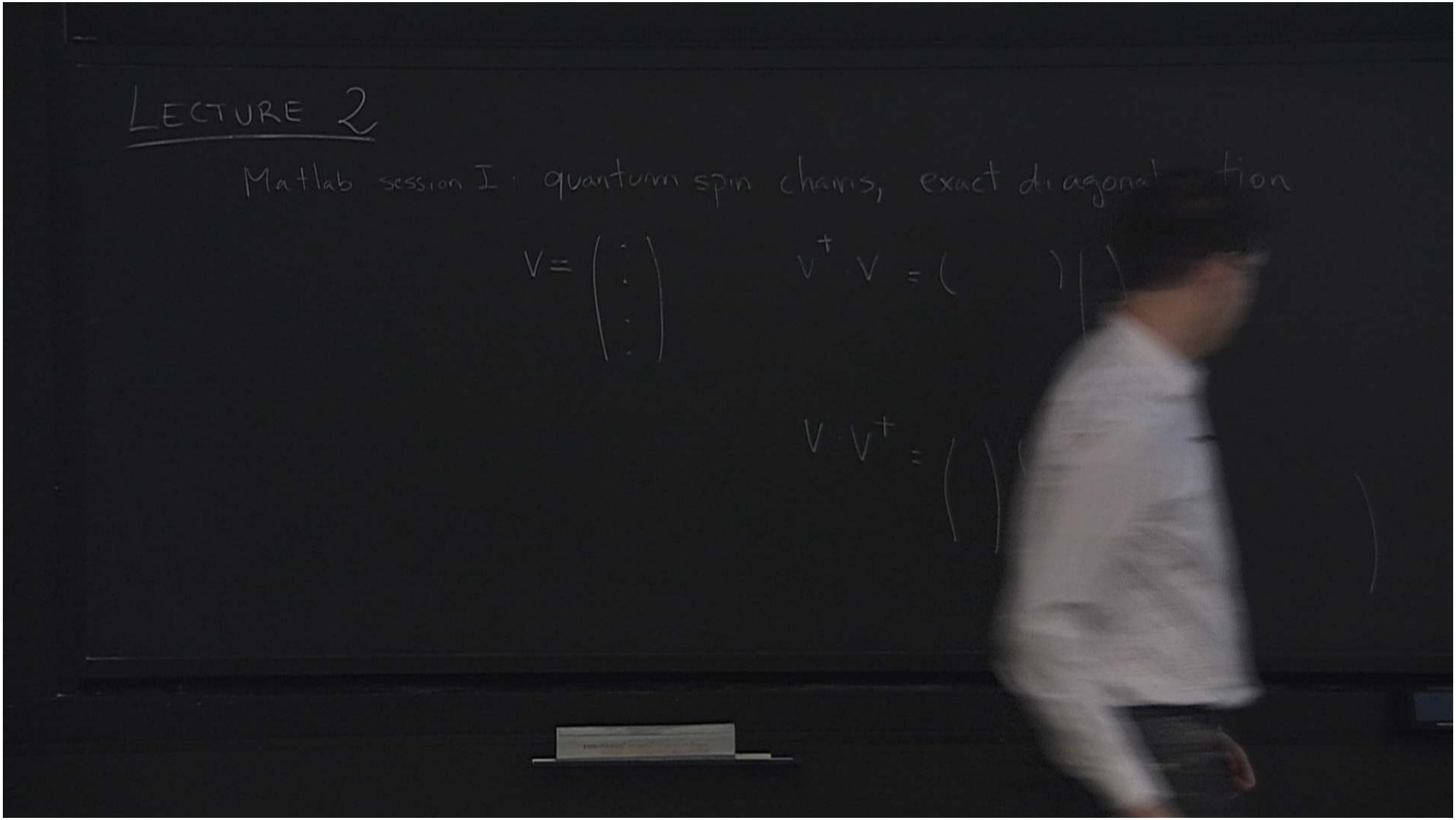
Title: 13/14 PSI - Explorations in Condensed Matter - Lecture 3

Date: Mar 19, 2014 10:15 AM

URL: http://pirsa.org/14040024

Abstract:


MATLAB R2013b
HOME
PLOTS
APPS
Search Documentation
New Script
New
Open
Find Files
Compare
Import Data
Save Workspace
New Variable
Open Variable
Clear Workspace
Analyze Code
Run and Time
Clear Commands
Layout
Preferences
Set Path
Help
Community
Request Support
Add-Ons
FILE
VARIABLE
CODE
ENVIRONMENT
RESOURCES
C: ▸ Users ▸ Guifre Vidal ▸ Documents ▸ MATLAB ▸
Current Folder
Name
PSI 2014 Session I TEST
ABChiNew10.mat
Analysis.m
breakT.m
breakT2.m
buildNewTensor.m
buildNewTensorExact.m
CompressMN.m
ComputeScalingDimensions.m
Contractor.m
DeltaSIsingN6Chi26.eps
DeltaSIsingN6Chi26.fig
eigApprox.m
ErrorsIsingN6Chi26.eps
ErrorsIsingN6Chi26.fig
ErrorsIsingN6Chi32.eps
ErrorsIsingN6Chi32.fig
ExDiagT.m
findContractor.m
hs_err_pid1264.log
invert.m
invertD.m
Ising.m
Ising2x2Chi4.mat
Ising2x2Chi4Isotropic.mat
Ising3x3Chi8Isotropic.mat
Ising3x3Chi18Isotropic.mat
Details
Command Window
New to MATLAB? Watch this Video, see Examples, or read Getting Started.
>> v = rand(4,1)
v =
0.8147
0.9058
0.1270
0.9134
>>
Workspace
Name
Value
v
[0.8147;0.9058;0.1270;
Command History
EV
U*EV*U'
H
U*EV*U'
U*EV*U'-H
norm(ans)
Basics
IsingN3
%-- 19/03/2014 10:11 AM --
%-- 19/03/2014 10:12 AM --
v = rand(4,1)
Recycle Bin
WinEdt 6
Adobe Reader X
branching selection
HP Support Assistant
YOGA
Mozilla Firefox
iTunes
OpenVPN GUI
Google Chrome
Skype
kitaevHoney
VLC media player
100APPLE
10:19 AM
19/03/2014

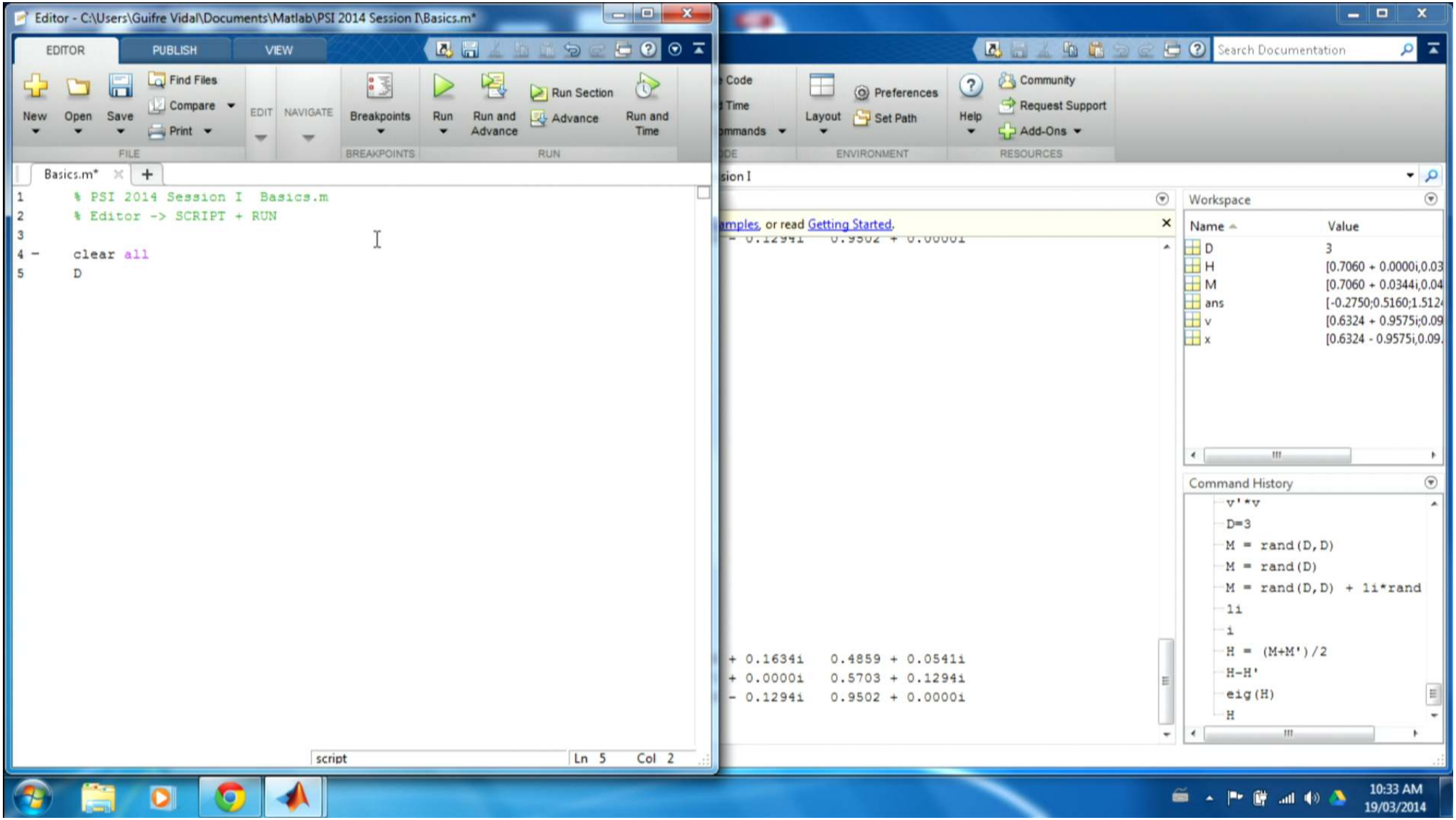

LECTURE 2
Matlab session I: quantum spin chains, exact diagonalization
$V = \begin{pmatrix} \vdots \\ \vdots \end{pmatrix}$
$V^\dagger \cdot V = ($
$V \cdot V^\dagger =$

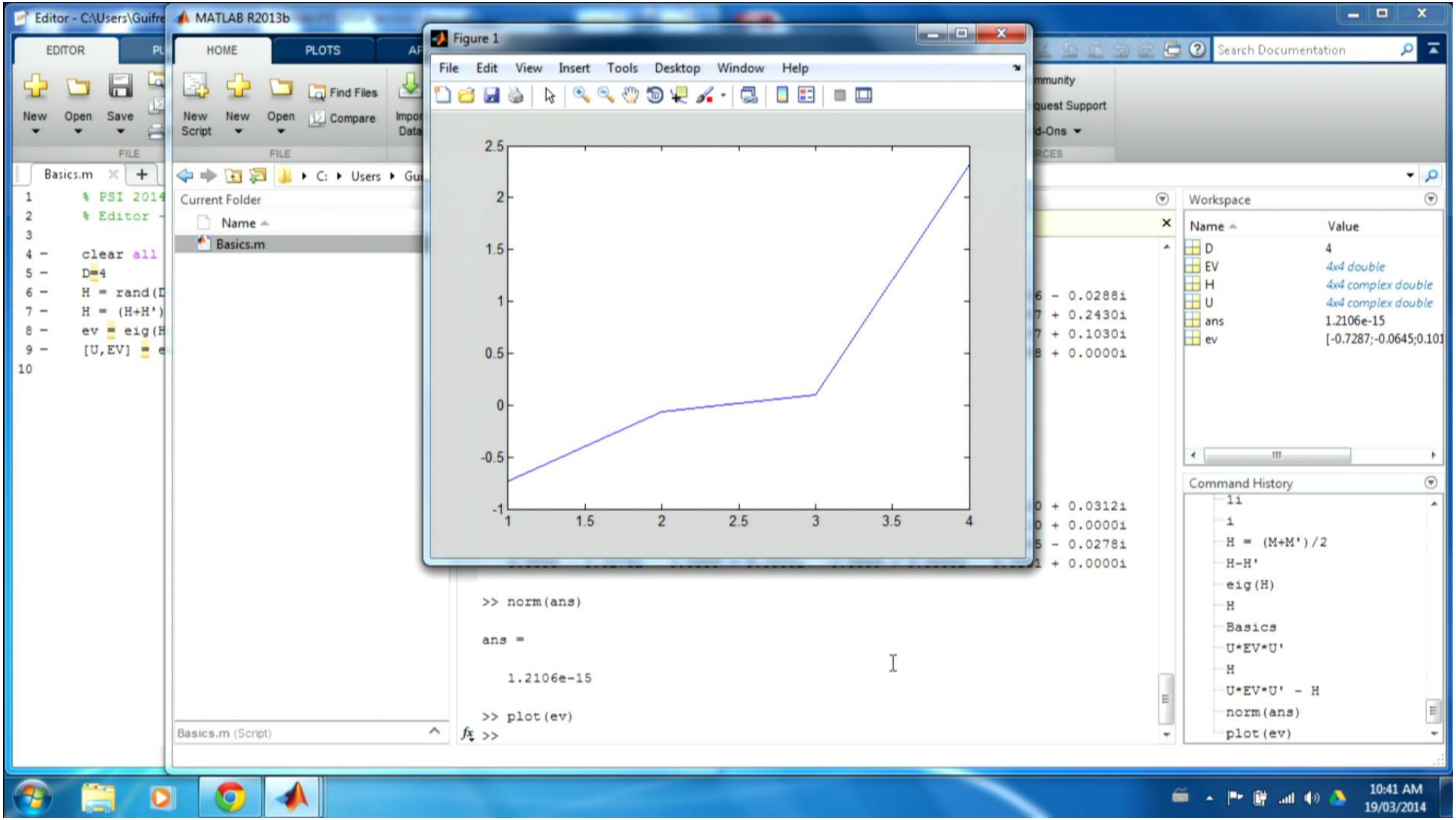
LECTURE 2

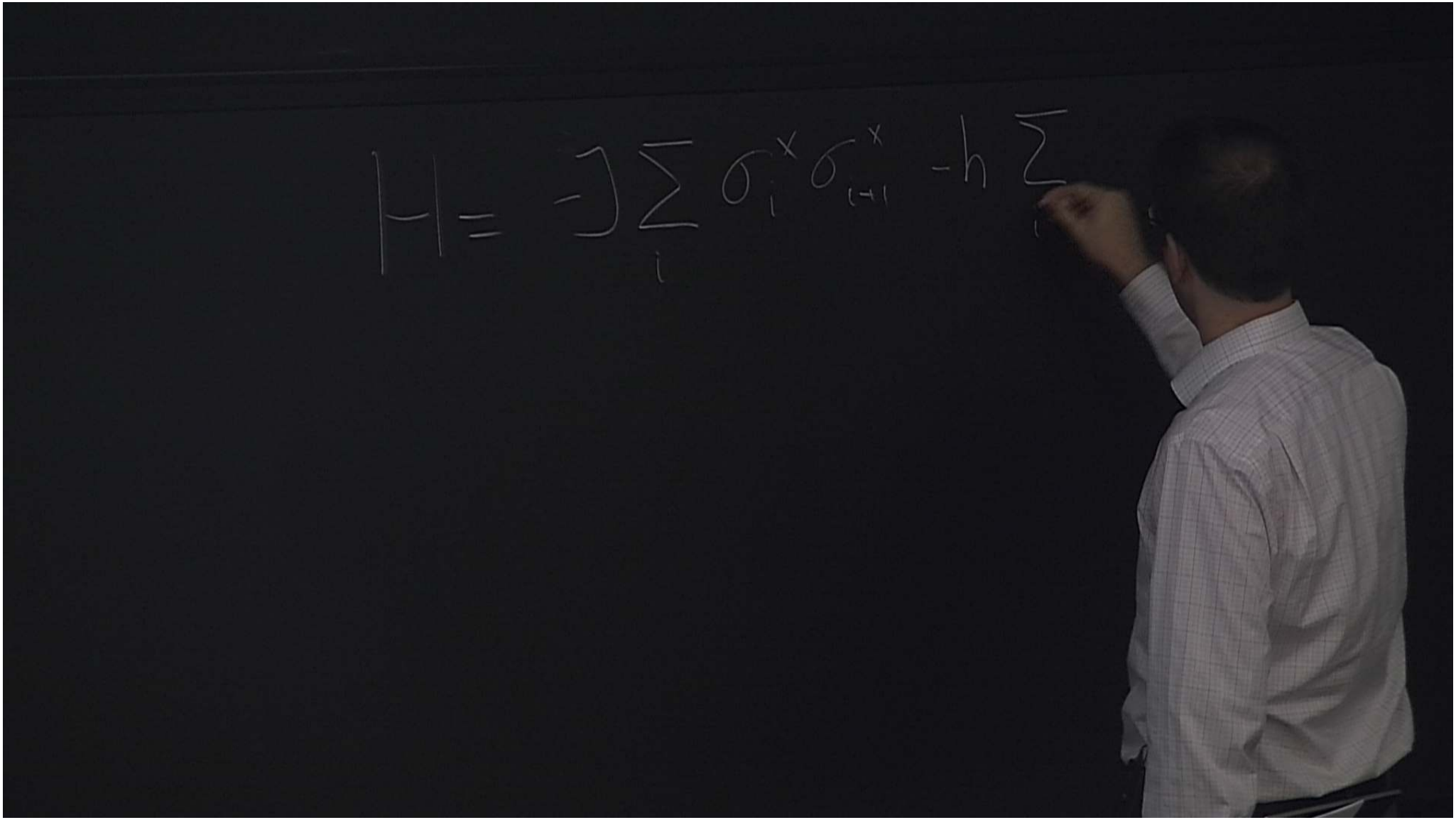
Matlab session I: quantum spin chains, exact diagonalization

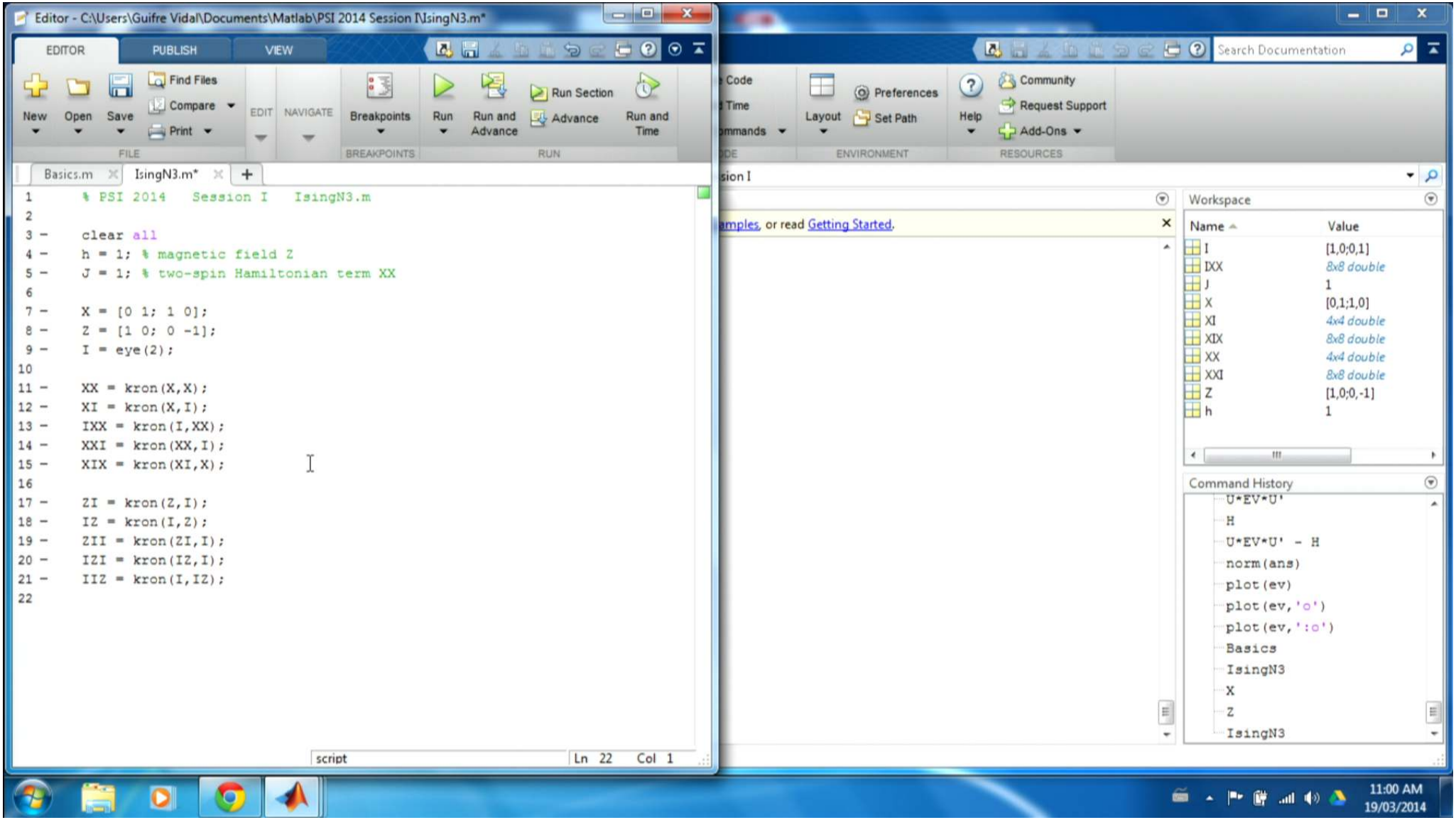
$V = \begin{pmatrix} \vdots \\ \vdots \end{pmatrix}$ $\quad V^\dagger \cdot V = (\quad)(\quad) = \#$

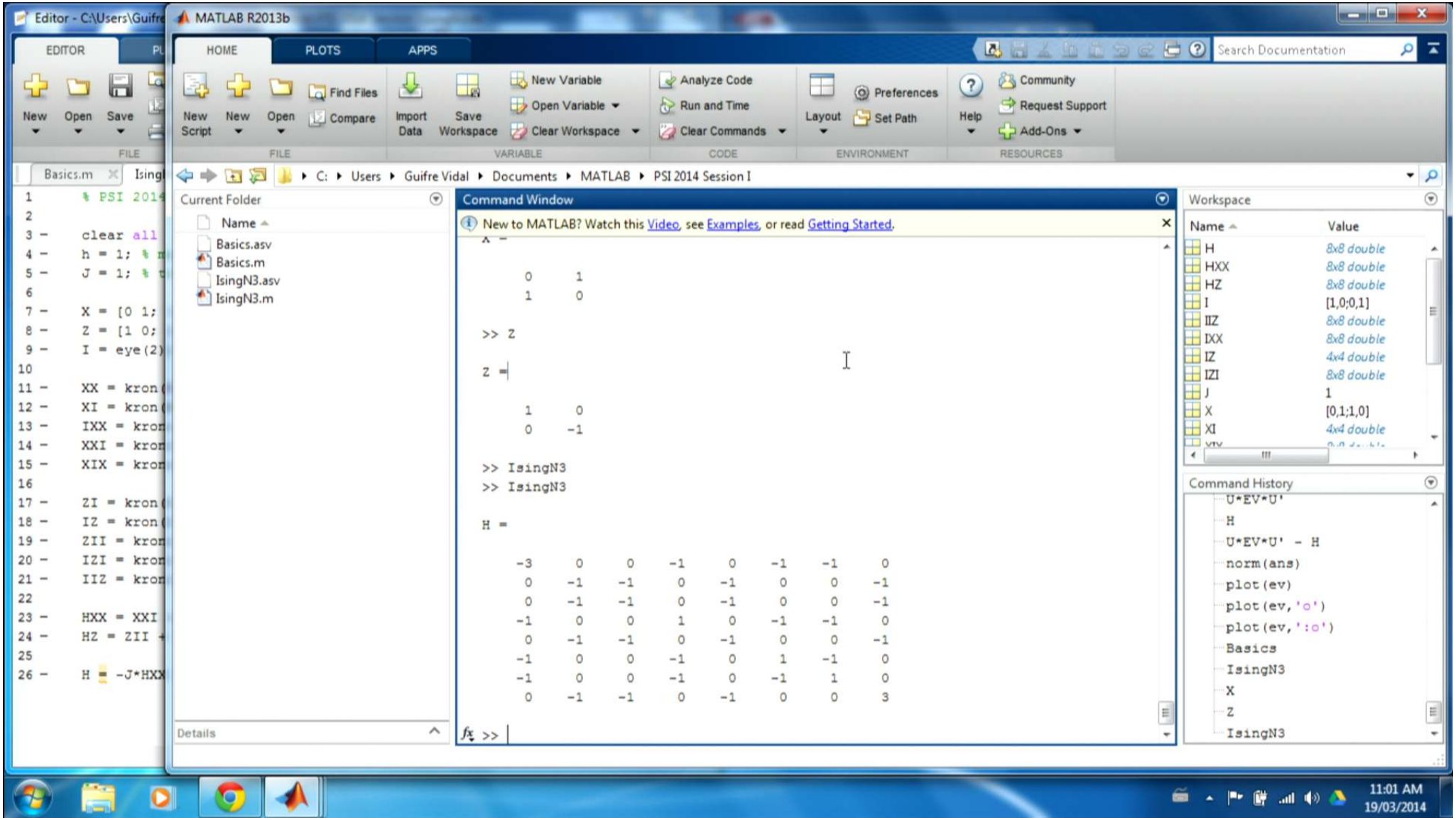
$V \cdot V^\dagger = (\quad)(\quad) = (\quad)$

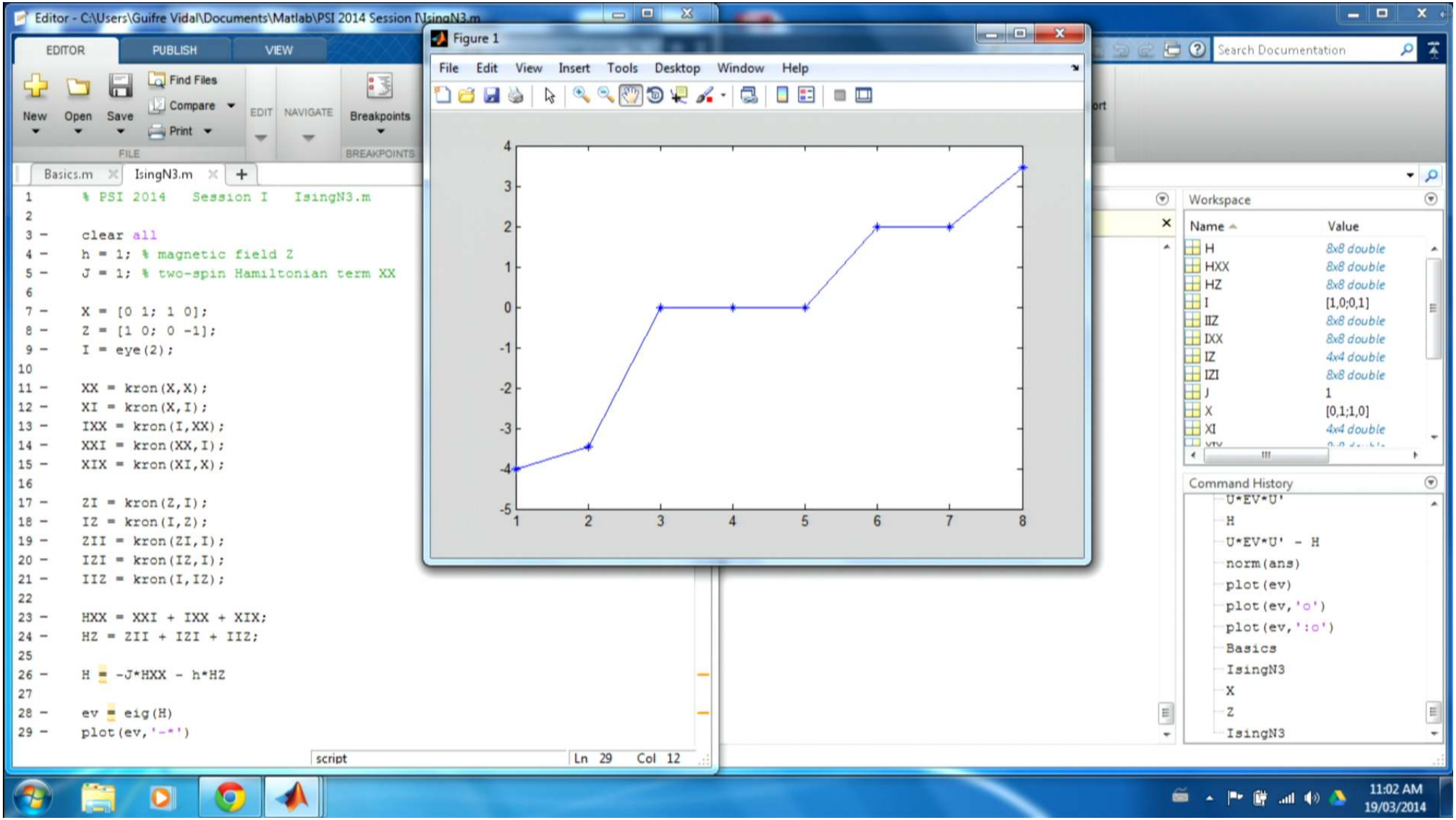

Editor - C:\Users\Guifre Vidal\Documents\Matlab\PSI 2014 Session I\Basics.m*
EDITOR
PUBLISH
VIEW
New
Open
Save
Find Files
Compare
Print
FILE
EDIT
NAVIGATE
Breakpoints
BREAKPOINTS
Run
Run and Advance
Run Section
Advance
Run and Time
RUN
Basics.m*
1 % PSI 2014 Session I Basics.m
2 % Editor -> SCRIPT + RUN
3
4 - clear all
5 D
script
Ln 5 Col 2
Search Documentation
Layout
Preferences
Set Path
ENVIRONMENT
Help
Community
Request Support
Add-Ons
RESOURCES
Workspace
Name
Value
D 3
H [0.7060 + 0.0000i,0.03
M [0.7060 + 0.0344i,0.04
ans [-0.2750;0.5160;1.512
v [0.6324 + 0.9575i;0.09
x [0.6324 - 0.9575i,0.09.
Command History
v'*v
D=3
M = rand(D,D)
M = rand(D)
M = rand(D,D) + 1i*rand
1i
i
H = (M+M')/2
H-H'
eig(H)
H
+ 0.1634i 0.4859 + 0.0541i
+ 0.0000i 0.5703 + 0.1294i
- 0.1294i 0.9502 + 0.0000i
10:33 AM
19/03/2014

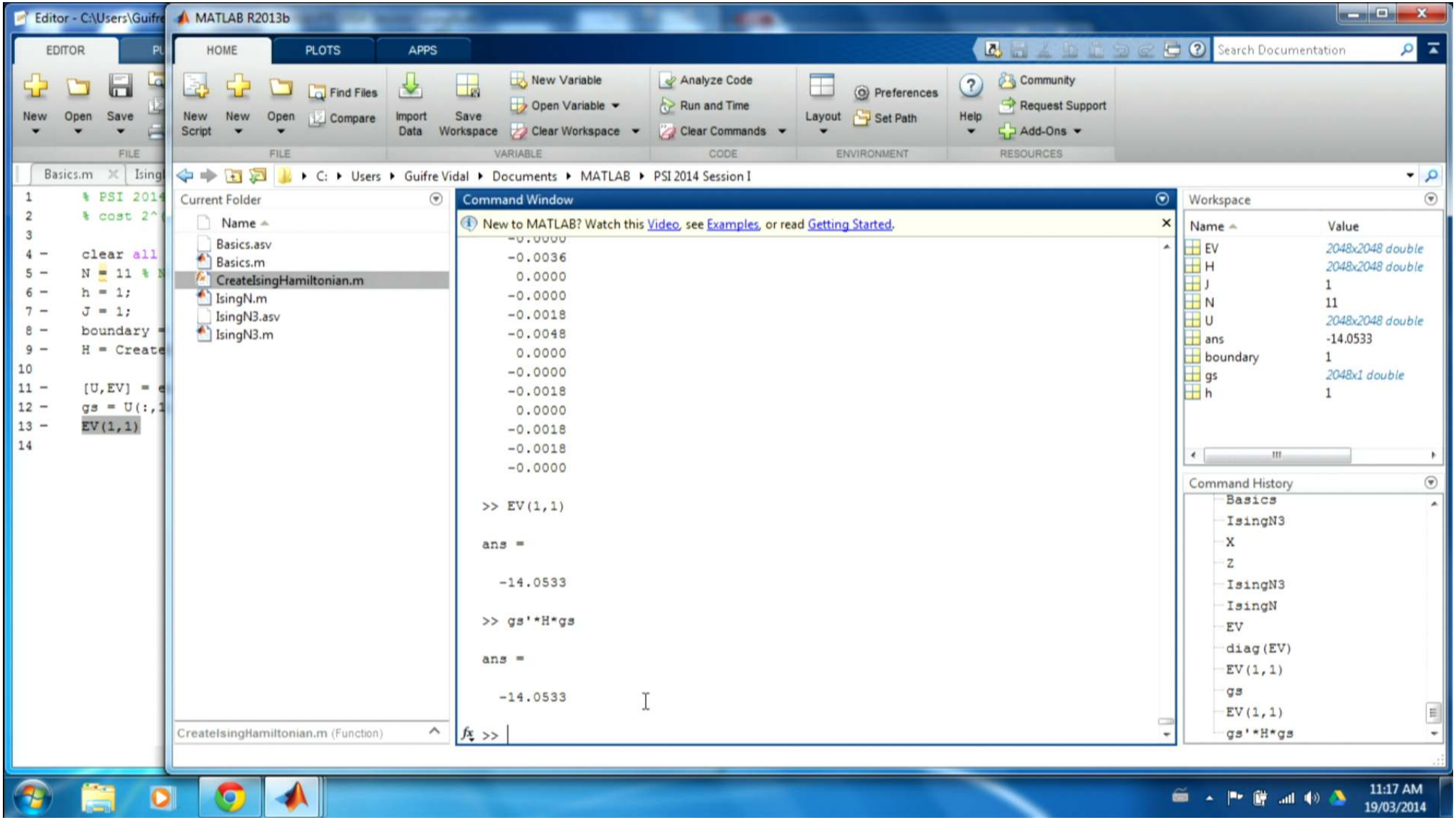

Editor - C:\Users\Guifre
MATLAB R2013b
Figure 1
File Edit View Insert Tools Desktop Window Help
Basics.m
Current Folder
Name
Basics.m
Workspace
Name Value
D 4
EV 4x4 double
H 4x4 complex double
U 4x4 complex double
ans 1.2106e-15
ev [-0.7287;-0.0645;0.101
Command History
>> norm(ans)
ans =
1.2106e-15
>> plot(ev)
>>
10:41 AM
19/03/2014


H = -J Σ_i σ_i^x σ_{i+1}^x - h Σ


Editor - C:\Users\Guifre Vidal\Documents\Matlab\PSI 2014 Session I\IsingN3.m*
EDITOR
PUBLISH
VIEW
New
Open
Save
Find Files
Compare
Print
FILE
EDIT
NAVIGATE
Breakpoints
BREAKPOINTS
Run
Run and Advance
Run Section
Advance
Run and Time
RUN
Basics.m
IsingN3.m*
1 % PSI 2014 Session I IsingN3.m
2
3 clear all
4 h = 1; % magnetic field Z
5 J = 1; % two-spin Hamiltonian term XX
6
7 X = [0 1; 1 0];
8 Z = [1 0; 0 -1];
9 I = eye(2);
10
11 XX = kron(X,X);
12 XI = kron(X,I);
13 IXX = kron(I,XX);
14 XXI = kron(XX,I);
15 XIX = kron(XI,X);
16
17 ZI = kron(Z,I);
18 IZ = kron(I,Z);
19 ZII = kron(ZI,I);
20 IZI = kron(IZ,I);
21 IIZ = kron(I,IZ);
22
script
Ln 22 Col 1
Search Documentation
Preferences
Set Path
Layout
Community
Request Support
Add-Ons
Help
ENVIRONMENT
RESOURCES
amples, or read Getting Started.
Workspace
Name
Value
I [1,0;0,1]
IXX 8x8 double
J 1
X [0,1;1,0]
XI 4x4 double
XIX 8x8 double
XX 4x4 double
XXI 8x8 double
Z [1,0;0,-1]
h 1
Command History
U*EV*U'
H
U*EV*U' - H
norm(ans)
plot(ev)
plot(ev,'o')
plot(ev,':o')
Basics
IsingN3
X
Z
IsingN3
11:00 AM
19/03/2014


Editor - C:\Users\Guifre
MATLAB R2013b
EDITOR
HOME
PLOTS
APPS
Search Documentation
New
Open
Save
New Script
New
Open
Find Files
Compare
Import Data
Save Workspace
New Variable
Open Variable
Clear Workspace
Analyze Code
Run and Time
Clear Commands
Layout
Preferences
Set Path
Help
Community
Request Support
Add-Ons
FILE
VARIABLE
CODE
ENVIRONMENT
RESOURCES
Basics.m
C: ▸ Users ▸ Guifre Vidal ▸ Documents ▸ MATLAB ▸ PSI 2014 Session I
Current Folder
Name
Basics.asv
Basics.m
IsingN3.asv
IsingN3.m
Details
Command Window
New to MATLAB? Watch this Video, see Examples, or read Getting Started.
X =
0 1
1 0
>> Z
Z =
1 0
0 -1
>> IsingN3
>> IsingN3
H =
-3 0 0 -1 0 -1 -1 0
0 -1 -1 0 -1 0 0 -1
0 -1 -1 0 -1 0 0 -1
-1 0 0 1 0 -1 -1 0
0 -1 -1 0 -1 0 0 -1
-1 0 0 -1 0 1 -1 0
-1 0 0 -1 0 -1 1 0
0 -1 -1 0 -1 0 0 3
fx >>
Workspace
Name
Value
H 8x8 double
HXX 8x8 double
HZ 8x8 double
I [1,0;0,1]
IIZ 8x8 double
IXX 8x8 double
IZ 4x4 double
IZI 8x8 double
J 1
X [0,1;1,0]
XI 4x4 double
Command History
U*EV*U'
H
U*EV*U' - H
norm(ans)
plot(ev)
plot(ev,'o')
plot(ev,':o')
Basics
IsingN3
X
Z
IsingN3
11:01 AM
19/03/2014


Editor - C:\Users\Guifre Vidal\Documents\Matlab\PSI 2014 Session I\IsingN3.m
EDITOR
PUBLISH
VIEW
New
Open
Save
Find Files
Compare
Print
Breakpoints
Basics.m
IsingN3.m
% PSI 2014 Session I IsingN3.m
clear all
h = 1; % magnetic field Z
J = 1; % two-spin Hamiltonian term XX
X = [0 1; 1 0];
Z = [1 0; 0 -1];
I = eye(2);
XX = kron(X,X);
XI = kron(X,I);
IXX = kron(I,XX);
XXI = kron(XX,I);
XIX = kron(XI,X);
ZI = kron(Z,I);
IZ = kron(I,Z);
ZII = kron(ZI,I);
IZI = kron(IZ,I);
IIZ = kron(I,IZ);
HXX = XXI + IXX + XIX;
HZ = ZII + IZI + IIZ;
H = -J*HXX - h*HZ
ev = eig(H)
plot(ev,'-*')
script
Ln 29 Col 12
Figure 1
File Edit View Insert Tools Desktop Window Help
Search Documentation
Workspace
Name Value
H 8x8 double
HXX 8x8 double
HZ 8x8 double
I [1,0;0,1]
IIZ 8x8 double
IXX 8x8 double
IZ 4x4 double
IZI 8x8 double
J 1
X [0,1;1,0]
XI 4x4 double
Command History
U*EV*U'
H
U*EV*U' - H
norm(ans)
plot(ev)
plot(ev,'o')
plot(ev,':o')
Basics
IsingN3
X
Z
IsingN3
11:02 AM
19/03/2014


Editor - C:\Users\Guifre
MATLAB R2013b
EDITOR
HOME
PLOTS
APPS
Search Documentation
New
Open
Save
New Script
New
Open
Find Files
Compare
Import Data
Save Workspace
New Variable
Open Variable
Clear Workspace
Analyze Code
Run and Time
Clear Commands
Layout
Preferences
Set Path
Help
Community
Request Support
Add-Ons
FILE
VARIABLE
CODE
ENVIRONMENT
RESOURCES
Basics.m
C: ▸ Users ▸ Guifre Vidal ▸ Documents ▸ MATLAB ▸ PSI 2014 Session I
Current Folder
Name
Basics.asv
Basics.m
CreateIsingHamiltonian.m
IsingN.m
IsingN3.asv
IsingN3.m
CreateIsingHamiltonian.m (Function)
Command Window
New to MATLAB? Watch this Video, see Examples, or read Getting Started.
-0.0036
0.0000
-0.0000
-0.0018
-0.0048
0.0000
-0.0000
-0.0018
0.0000
-0.0018
-0.0018
-0.0000
>> EV(1,1)
ans =
-14.0533
>> gs'*H*gs
ans =
-14.0533
Workspace
Name
Value
EV
2048x2048 double
H
2048x2048 double
J
1
N
11
U
2048x2048 double
ans
-14.0533
boundary
1
gs
2048x1 double
h
1
Command History
Basics
IsingN3
X
Z
IsingN3
IsingN
EV
diag(EV)
EV(1,1)
gs
EV(1,1)
gs'*H*gs
11:17 AM
19/03/2014