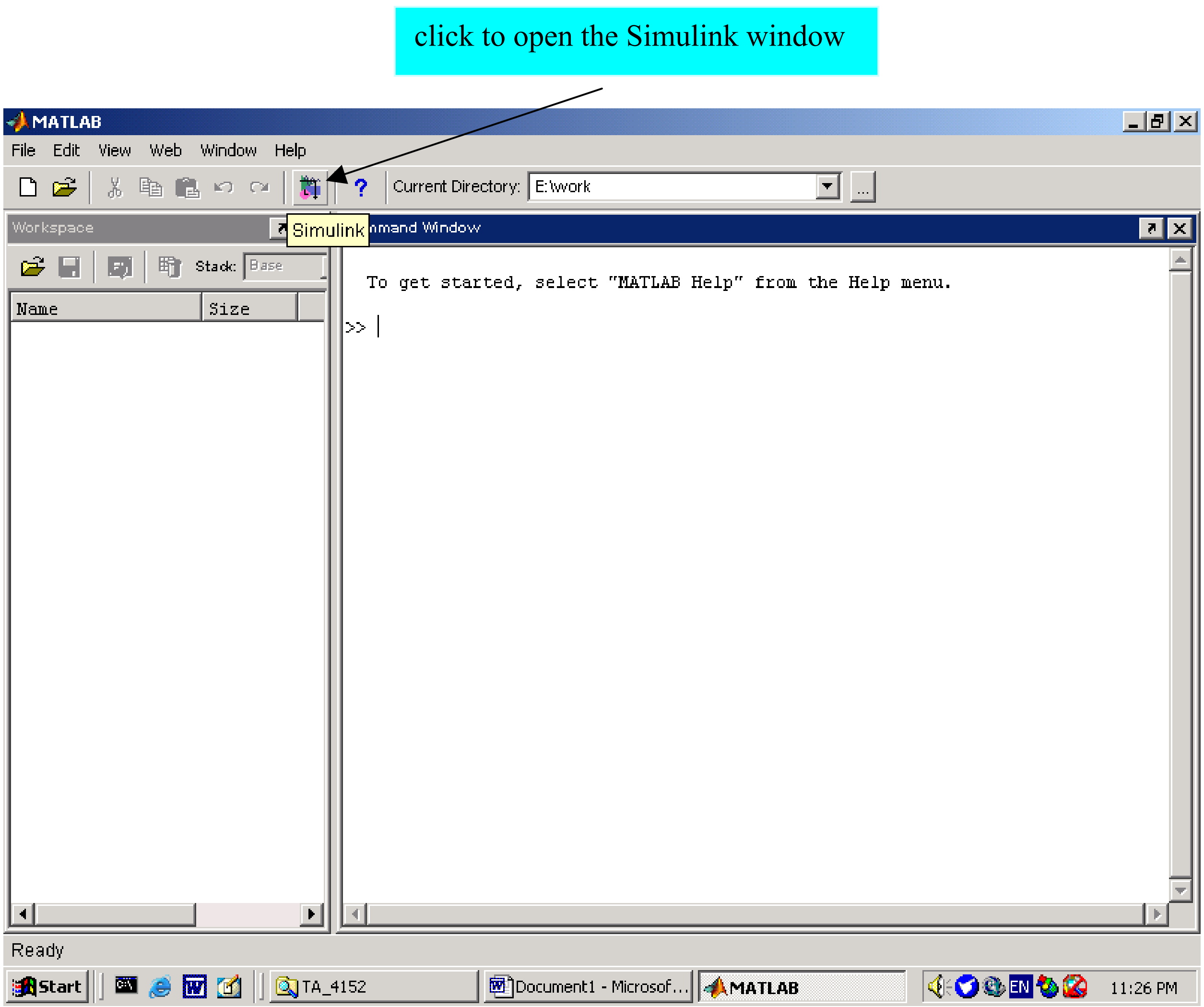
To be familiar with the library/ function blocks in Simulink.

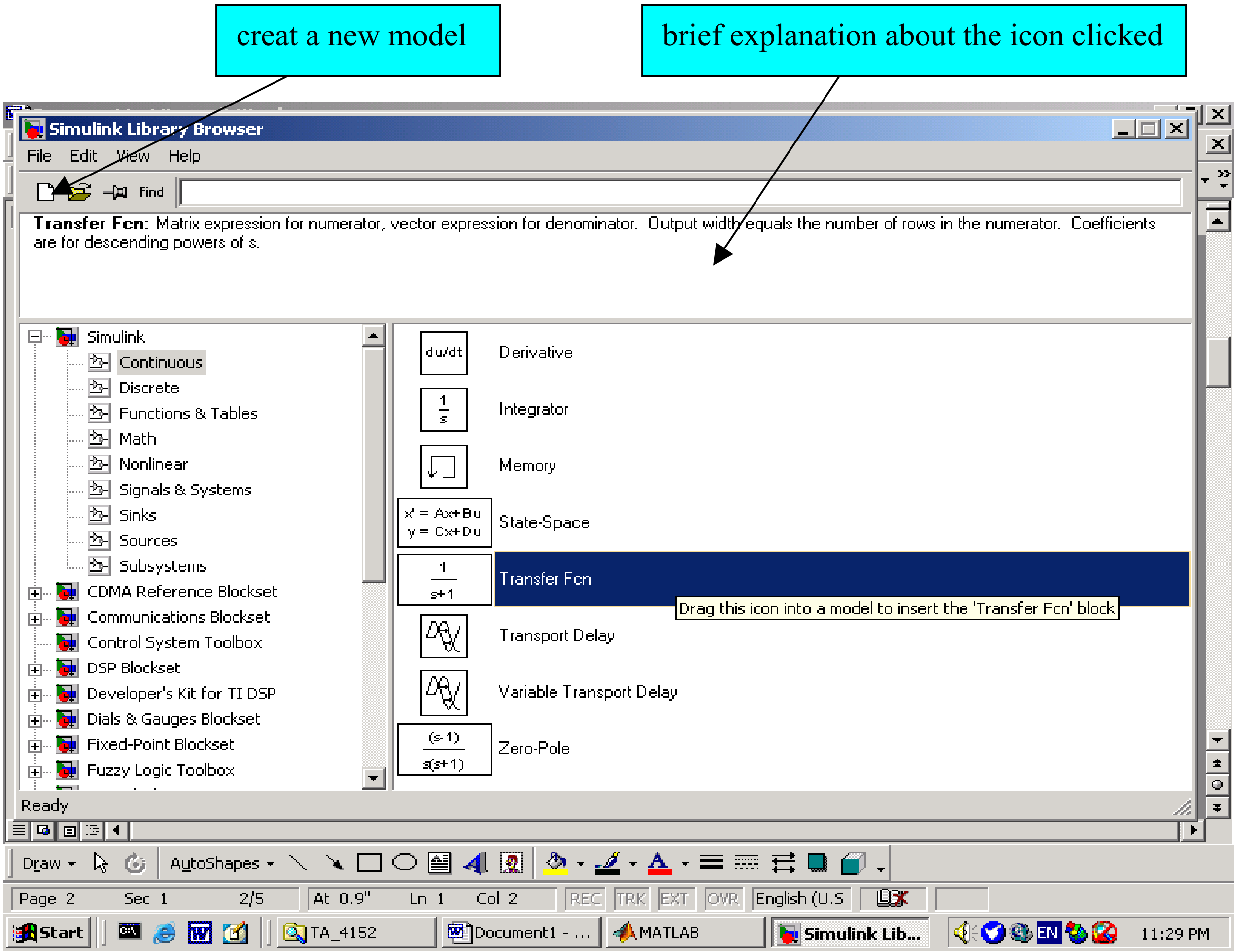
1) How to generate a model in Simulink;

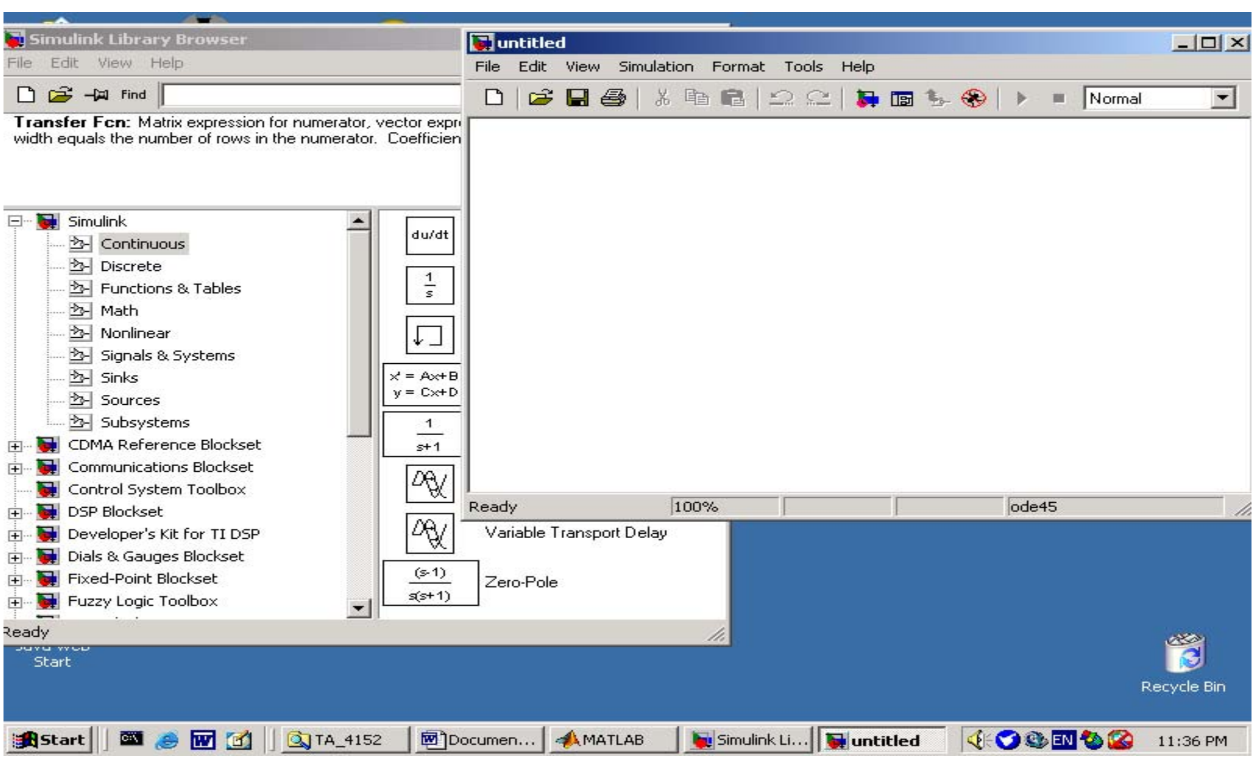
2) How to specify the block parameters;

3) How to simulate and observe the system response;

1)How to generate a model in Simulink, be familiar with the Simulink library;




creat a new model
brief explanation about the icon clicked
Simulink Library Browser
File Edit View Help
Find
Transfer Fcn: Matrix expression for numerator, vector expression for denominator. Output width equals the number of rows in the numerator. Coefficients are for descending powers of s.
Simulink
Continuous
Discrete
Functions & Tables
Math
Nonlinear
Signals & Systems
Sinks
Sources
Subsystems
CDMA Reference Blockset
Communications Blockset
Control System Toolbox
DSP Blockset
Developer's Kit for TI DSP
Dials & Gauges Blockset
Fixed-Point Blockset
Fuzzy Logic Toolbox
Derivative
Integrator
Memory
State-Space
Transfer Fcn
Drag this icon into a model to insert the 'Transfer Fcn' block
Transport Delay
Variable Transport Delay
Zero-Pole
Ready


Simulink Library Browser
untitled
File Edit View Simulation Format Tools Help
Normal
Transfer Fcn: Matrix expression for numerator, vector expr
width equals the number of rows in the numerator. Coefficien
Simulink
Continuous
Discrete
Functions & Tables
Math
Nonlinear
Signals & Systems
Sinks
Sources
Subsystems
CDMA Reference Blockset
Communications Blockset
Control System Toolbox
DSP Blockset
Developer's Kit for TI DSP
Dials & Gauges Blockset
Fixed-Point Blockset
Fuzzy Logic Toolbox
Ready
100%
ode45
Variable Transport Delay
Zero-Pole
Recycle Bin

drag the icons you need into the model to insert a function, then connect them.

the main functions we used:

a. continuous: derivative, integrator, state-space system, transfer function, zero-pole ;

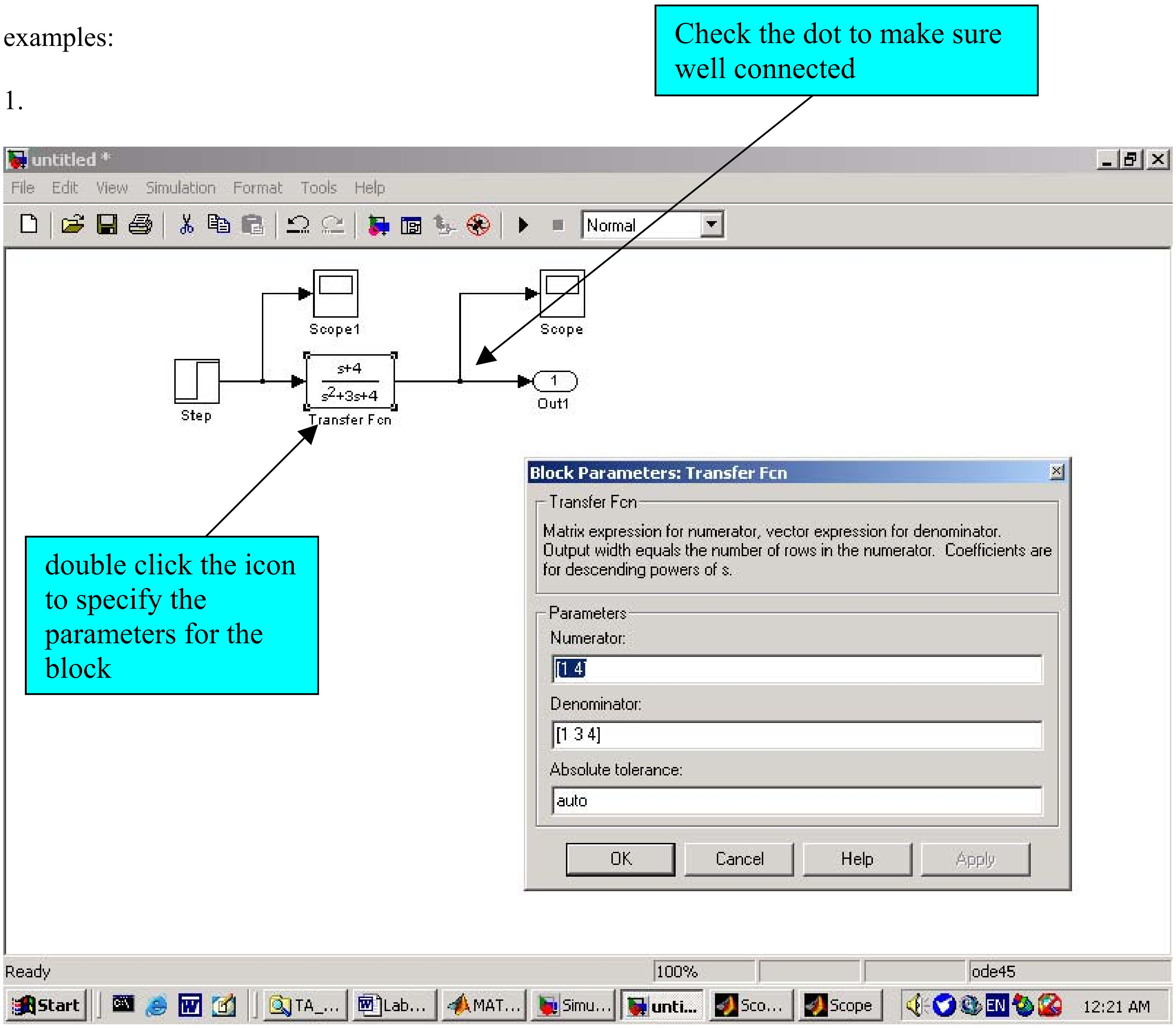
b. math: Abs, gain, math function, matrix gain, product, sum, trigonometric function;

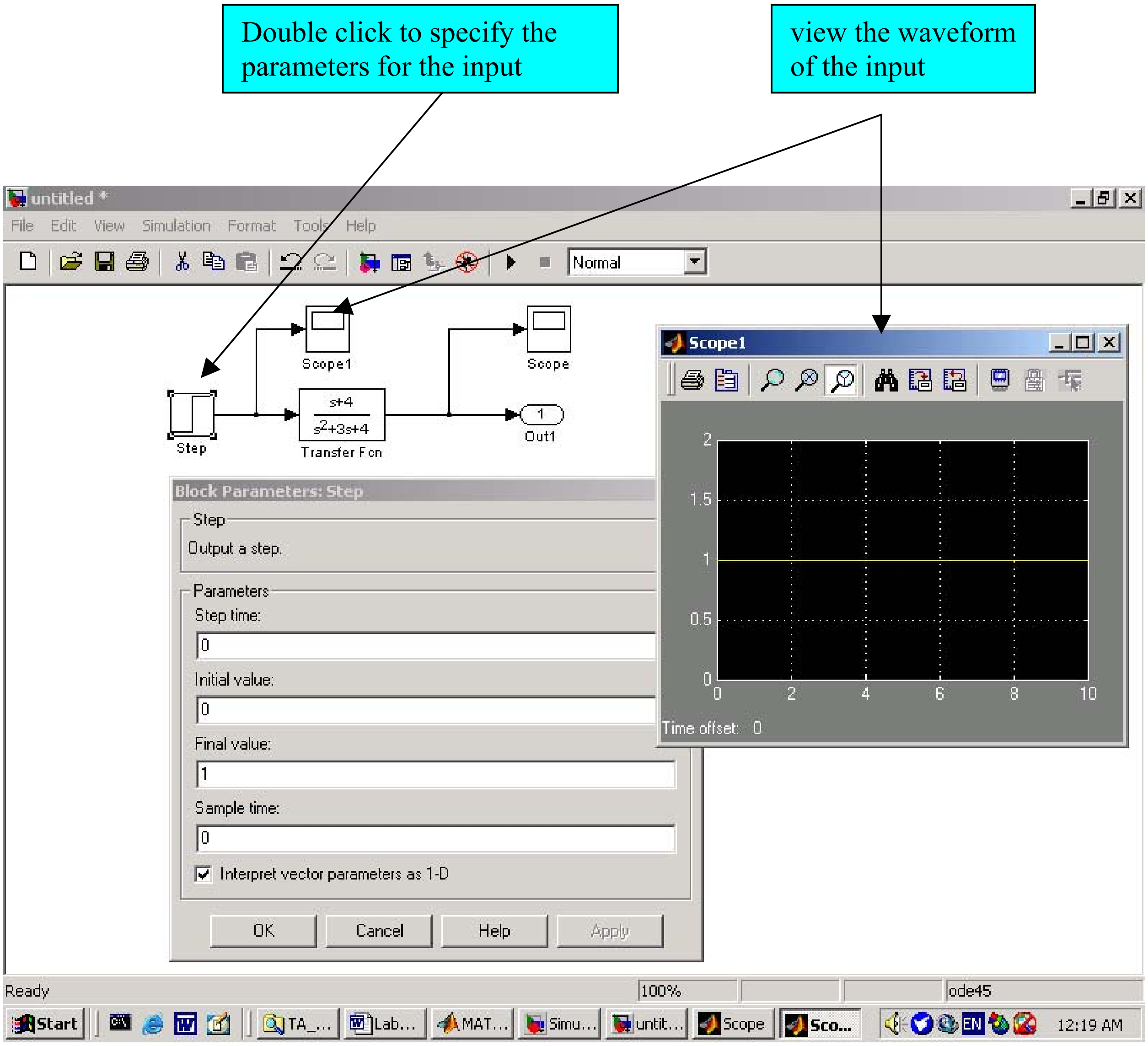
c. sinks: out, scope,display, xy graph, to workspace;

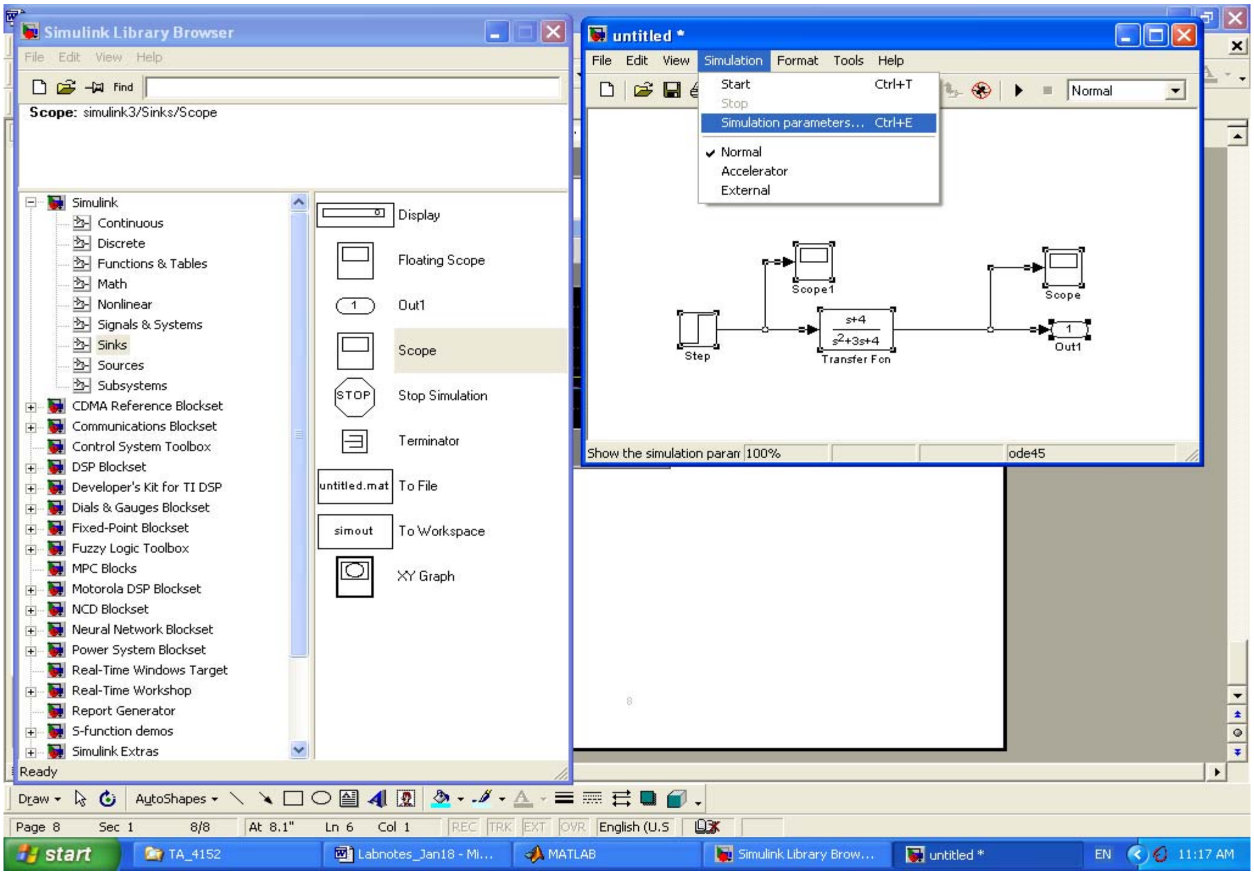
d. sources: signal generator, sine wave, step;

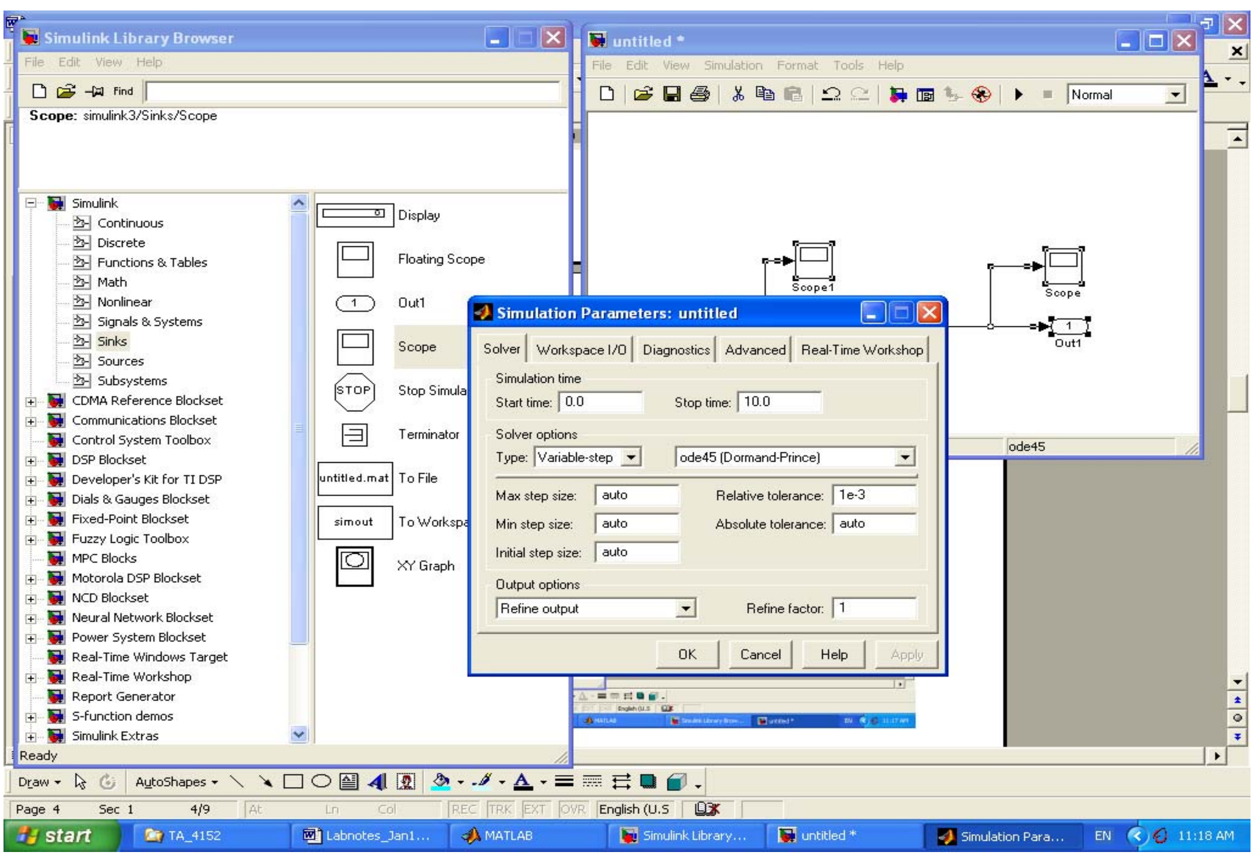
examples:

1.

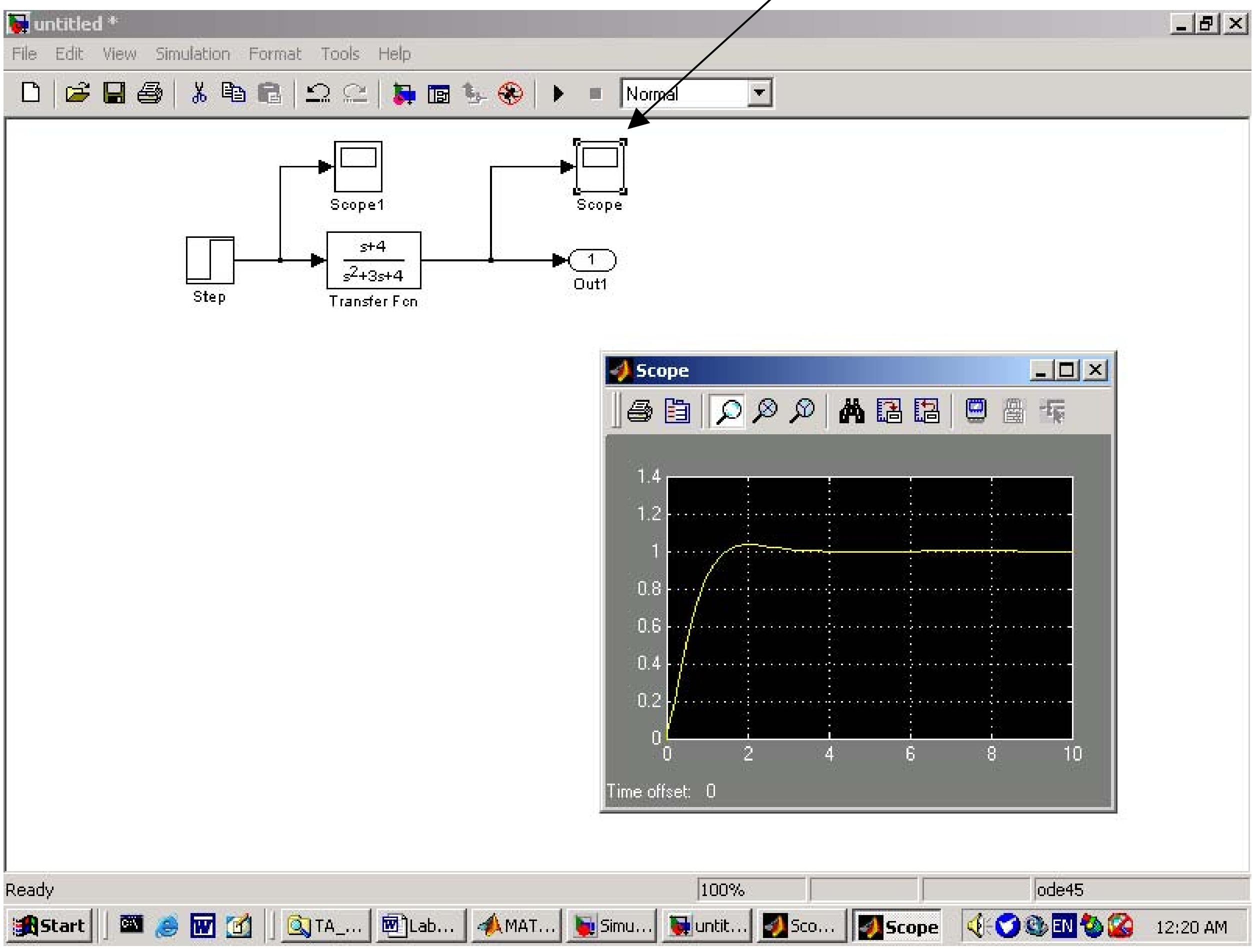



Double click to specify the parameters for the input
view the waveform of the input
untitled *
File Edit View Simulation Format Tools Help
Normal
Scope1
Scope
Step
s+4
s^2+3s+4
Transfer Fcn
1
Out1
Block Parameters: Step
Step
Output a step.
Parameters
Step time:
0
Initial value:
0
Final value:
1
Sample time:
0
Interpret vector parameters as 1-D
OK
Cancel
Help
Apply
Scope1
2
1.5
1
0.5
0
0
2
4
6
8
10
Time offset: 0
Ready
100%
ode45
Start
12:19 AM

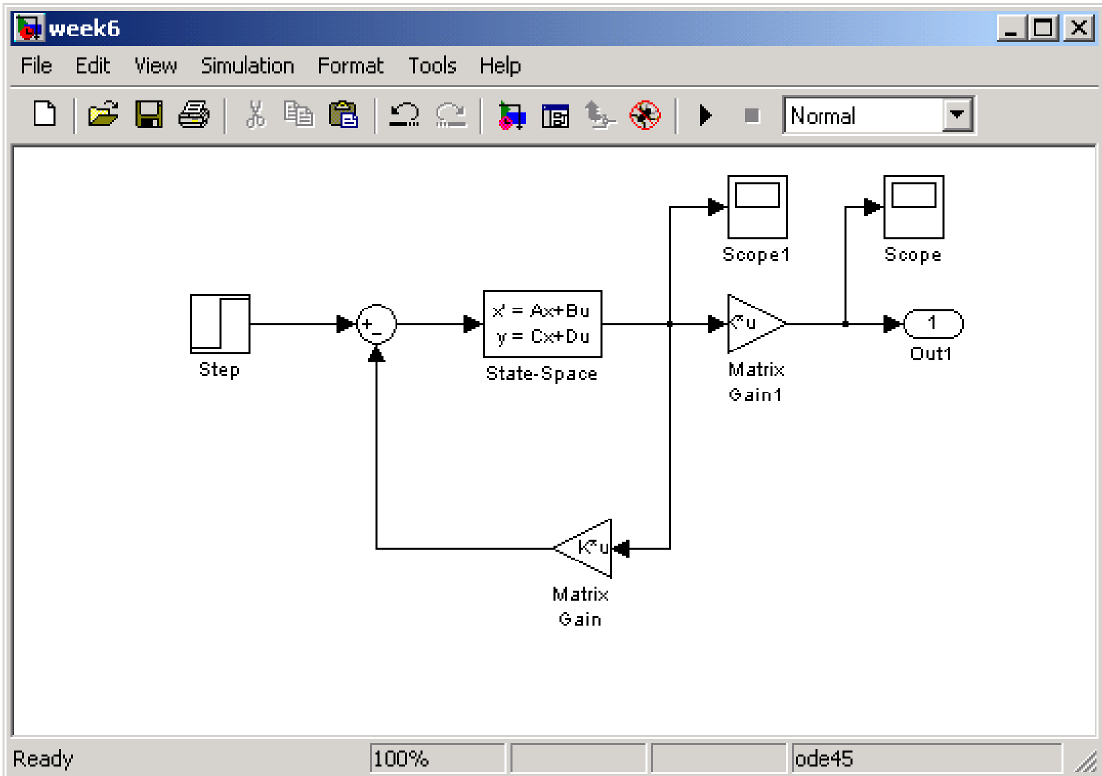

Simulink Library Browser
Scope: simulink3/Sinks/Scope
untitled *
File Edit View Simulation Format Tools Help
Start Ctrl+T
Stop
Simulation parameters... Ctrl+E
Normal
Accelerator
External
Step
Scope1
$\frac{s+4}{s^2+3s+4}$
Transfer Fcn
Scope
Out1
Show the simulation paran 100%
ode45


Simulation Parameters: untitled
Solver
Workspace I/O
Diagnostics
Advanced
Real-Time Workshop
Simulation time
Start time: 0.0
Stop time: 10.0
Solver options
Type: Variable-step
ode45 (Dormand-Prince)
Max step size: auto
Relative tolerance: 1e-3
Min step size: auto
Absolute tolerance: auto
Initial step size: auto
Output options
Refine output
Refine factor: 1
OK
Cancel
Help
Apply

double click the **Scope** icon to view the figure of the output

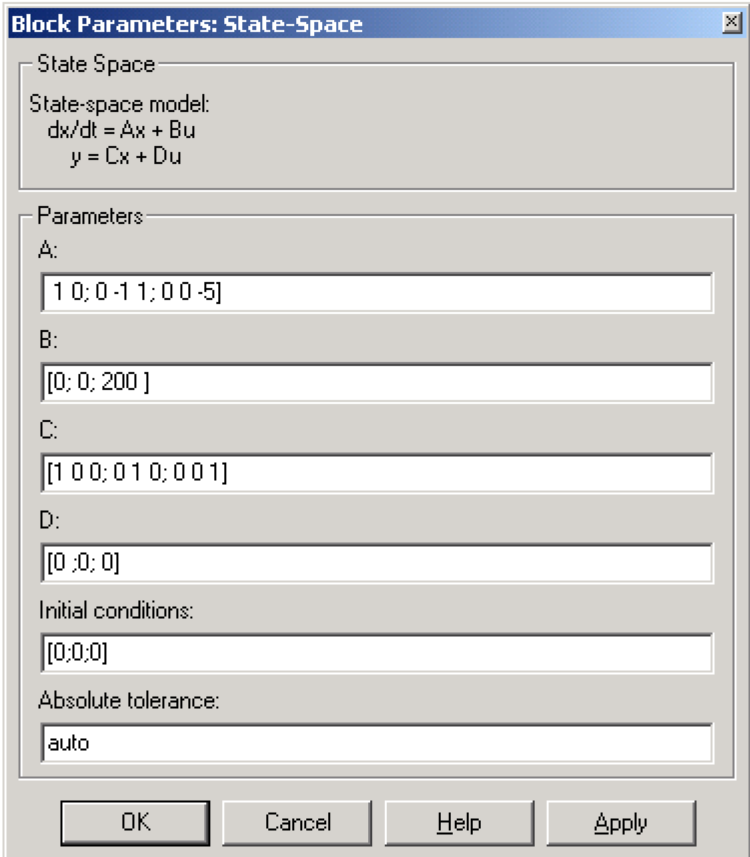


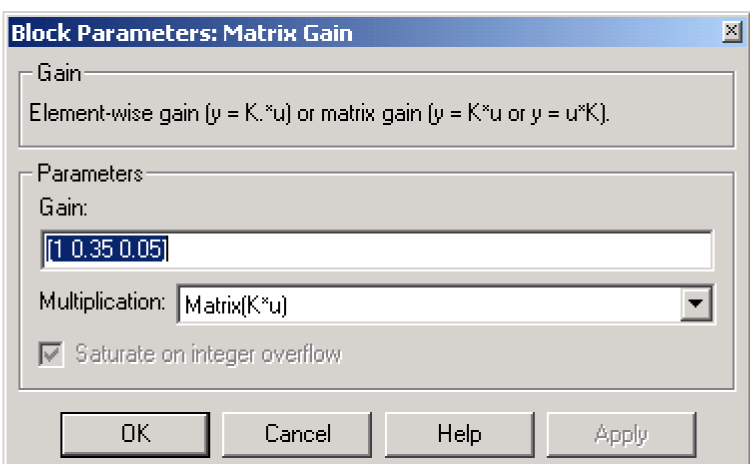
2. Try to simulate the system designed in example 11.4



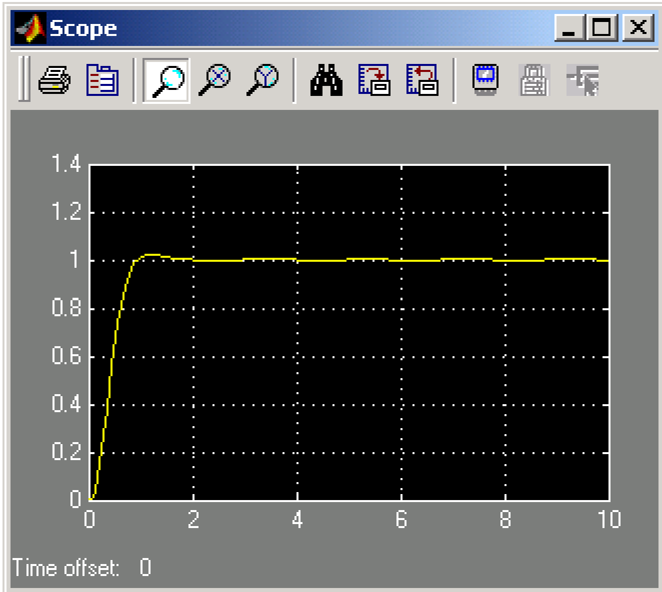
$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & -1 & 1 \\ 0 & 0 & -5 \end{bmatrix},\ B = \begin{bmatrix} 0 \\ 0 \\ 200 \end{bmatrix},\ C = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix};\ D = [0];$$

the state variable feedback $u = [1.0 \quad 0.35 \quad 0.05]\mathrm{x}$


Block Parameters: State-Space
State Space
State-space model:
dx/dt = Ax + Bu
y = Cx + Du
Parameters
A:
1 0; 0 -1 1; 0 0 -5]
B:
[0; 0; 200]
C:
[1 0 0; 0 1 0; 0 0 1]
D:
[0 ;0; 0]
Initial conditions:
[0;0;0]
Absolute tolerance:
auto
OK
Cancel
Help
Apply


Block Parameters: Matrix Gain
Gain
Element-wise gain (y = K.*u) or matrix gain (y = K*u or y = u*K).
Parameters
Gain:
[1 0.35 0.05]
Multiplication:
Matrix(K*u)
Saturate on integer overflow
OK
Cancel
Help
Apply

output y(t):



state variable x(t):