Jerry Olds

1001533643

IE-4378-001

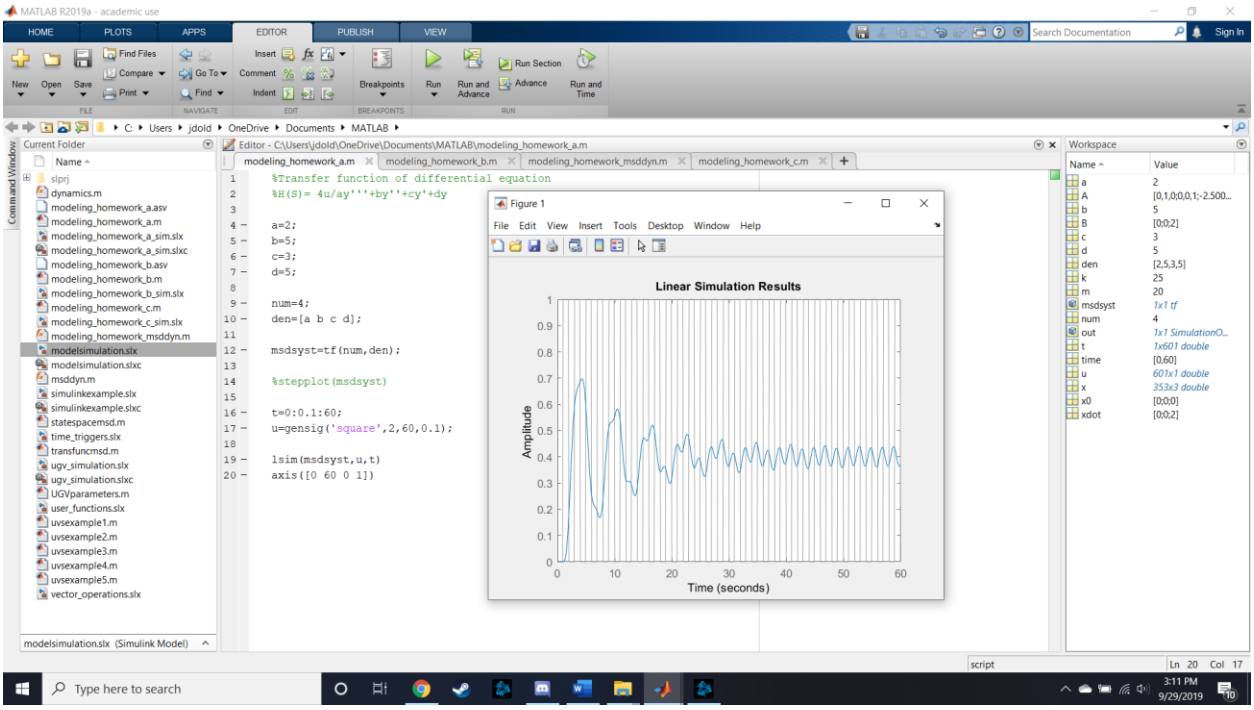
9/30/2019

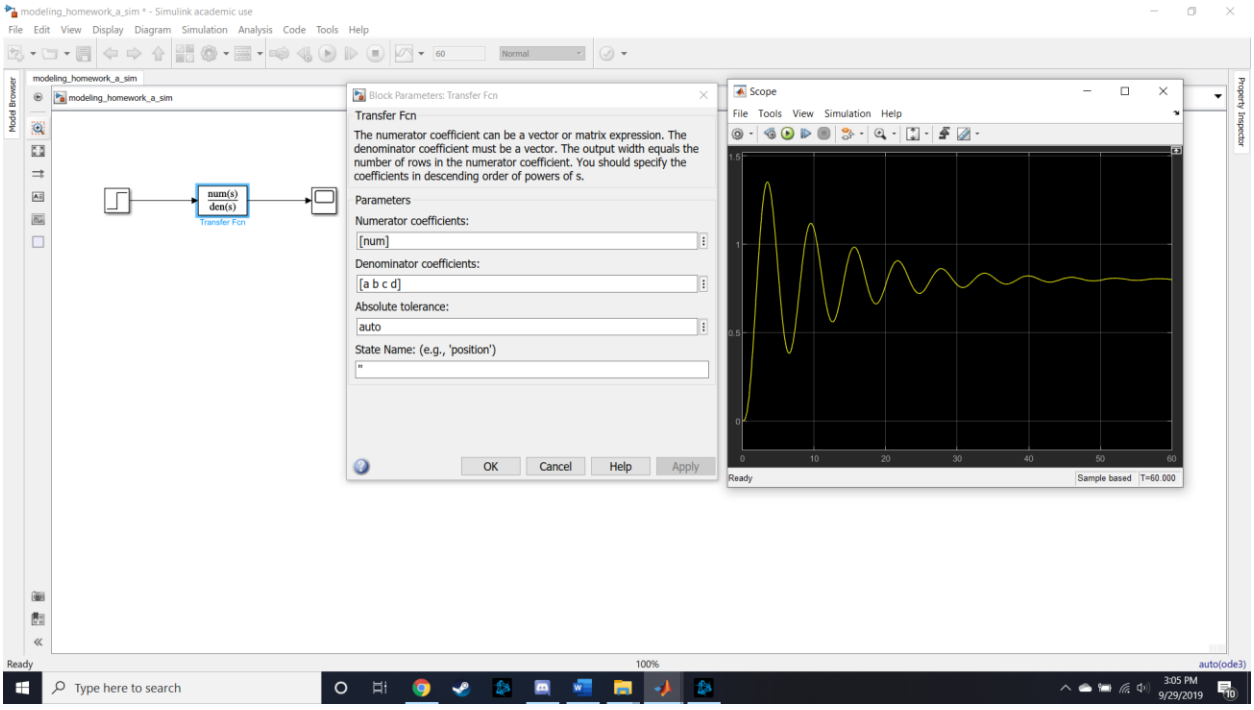
Modeling Homework

* May have to zoom to see code and graphs

a)

$H(s) = 4/2ay'''+5by''+3cy'+5dy$




modeling_homework_a_sim * - Simulink academic use
File Edit View Display Diagram Simulation Analysis Code Tools Help
modeling_homework_a_sim
num(s)
den(s)
Transfer Fcn
Block Parameters: Transfer Fcn
Transfer Fcn
The numerator coefficient can be a vector or matrix expression. The denominator coefficient must be a vector. The output width equals the number of rows in the numerator coefficient. You should specify the coefficients in descending order of powers of s.
Parameters
Numerator coefficients:
[num]
Denominator coefficients:
[a b c d]
Absolute tolerance:
auto
State Name: (e.g., 'position')
''
OK
Cancel
Help
Apply
Scope
File Tools View Simulation Help
Ready
Sample based
T=60.000
Ready
100%
auto(ode3)
Type here to search
3:05 PM
9/29/2019

b)

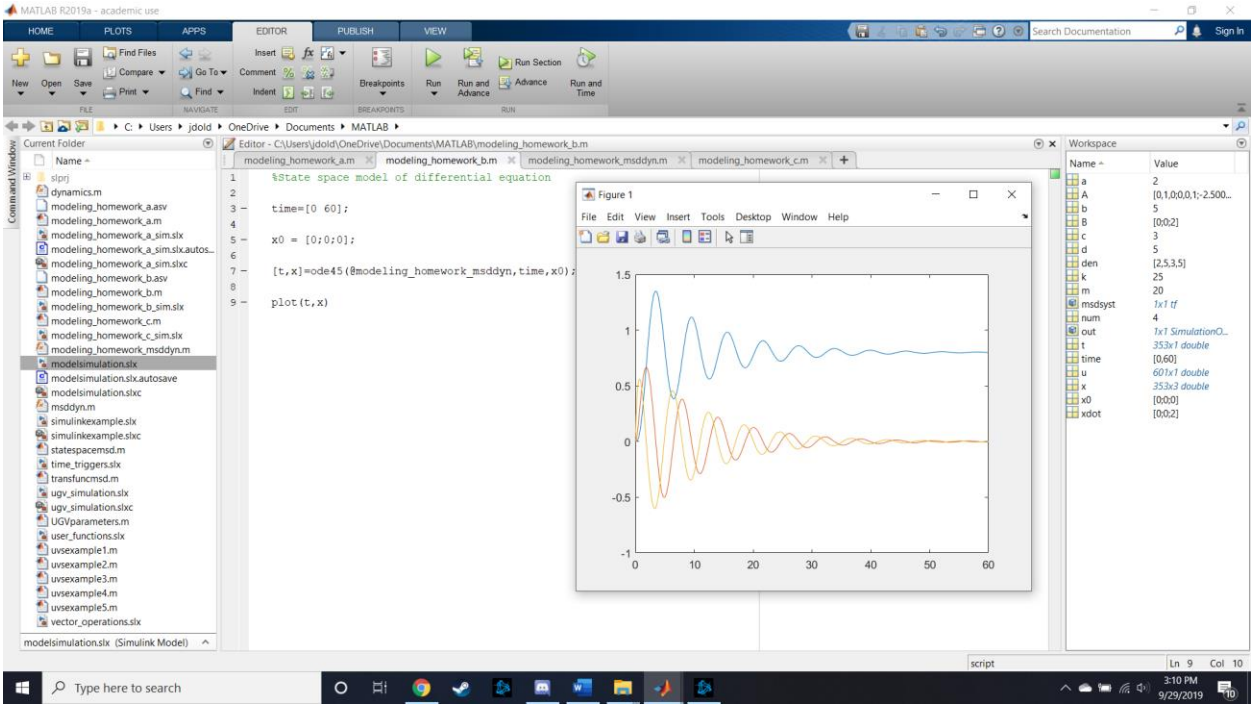
$x_1 = y$

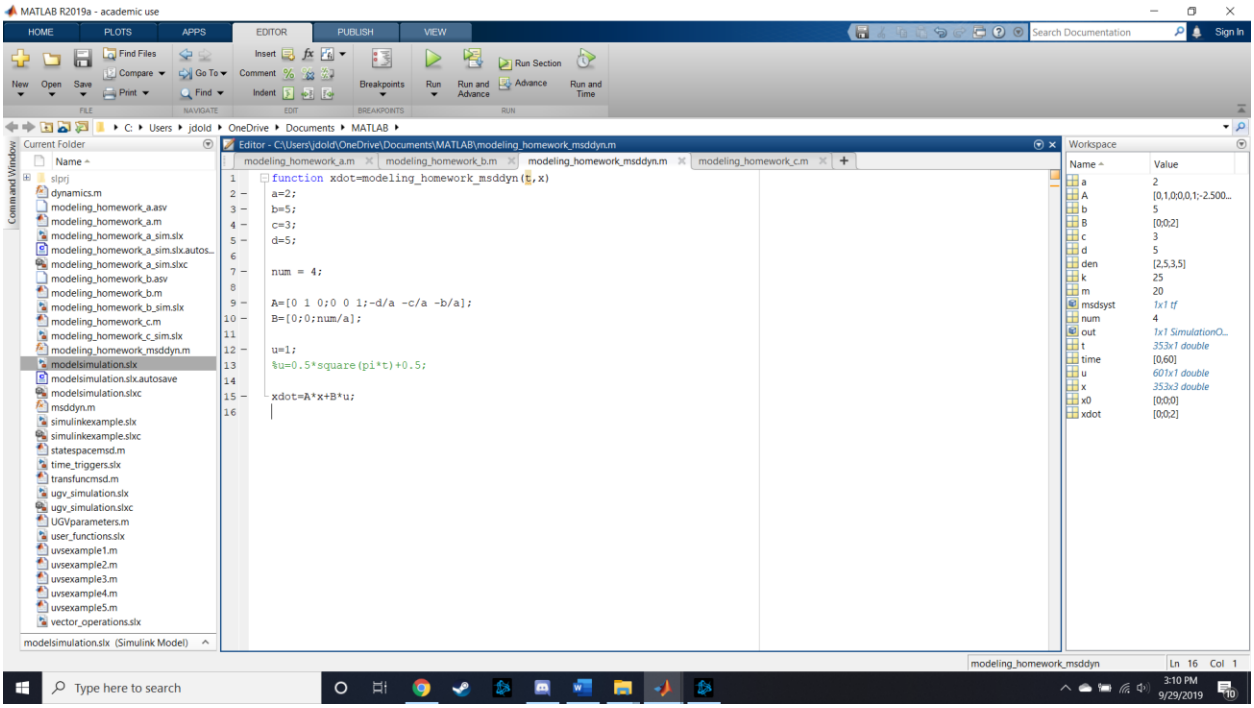
$x_2 = x_1' = y'$

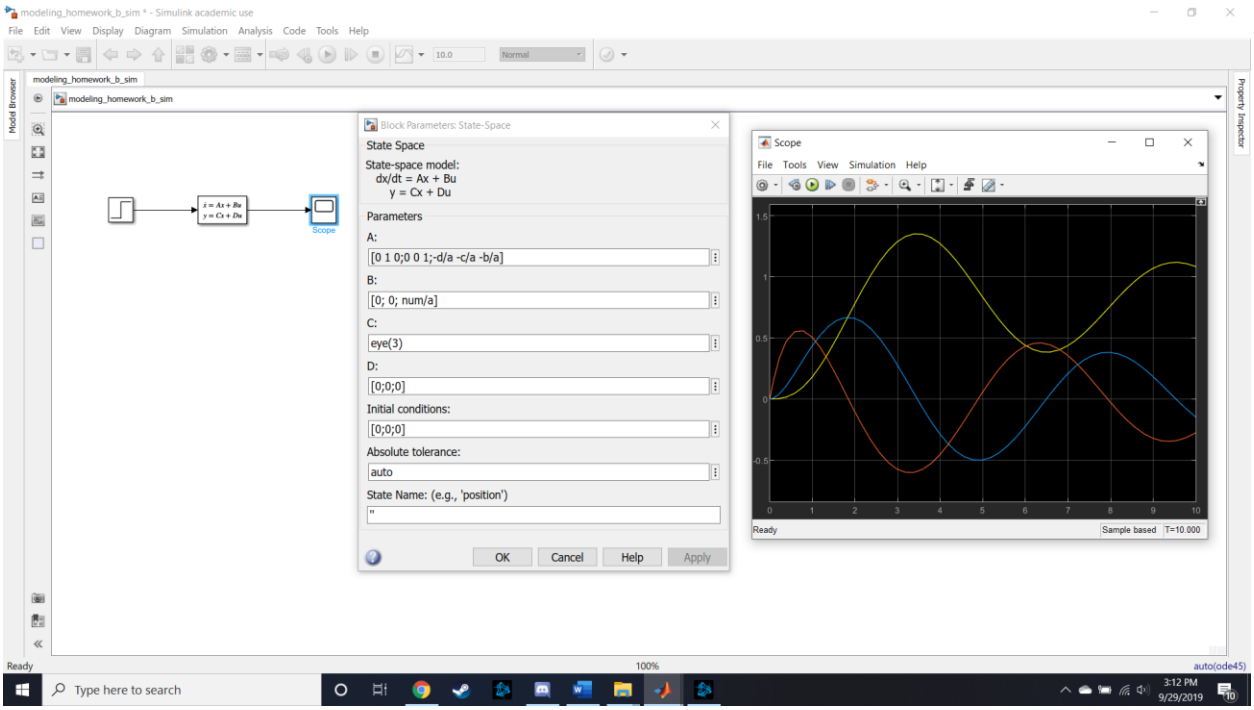
$x_3 = x_2' = y''$

$2y''' + 5x_3 + 3x_2 + 5x_1 = 4u$

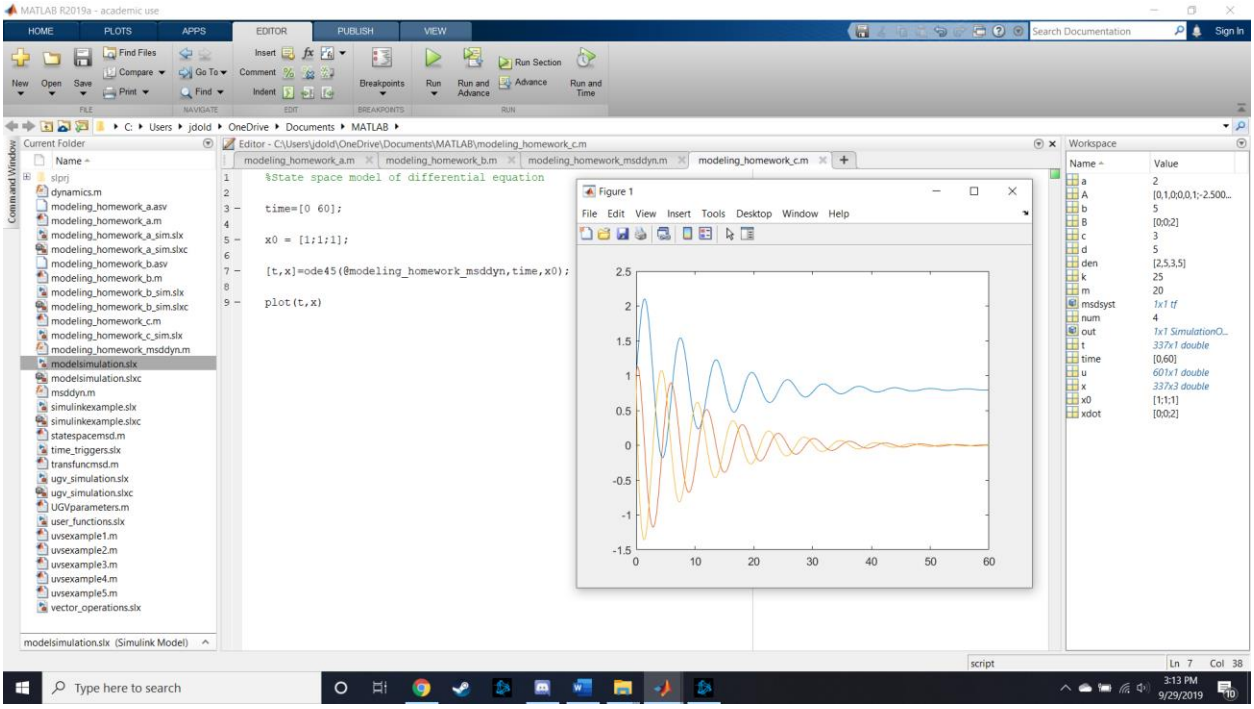
$y''' = x_3' = -5/2x_3 - 3/2x_2 - 5/2x_1 + 4/2u$

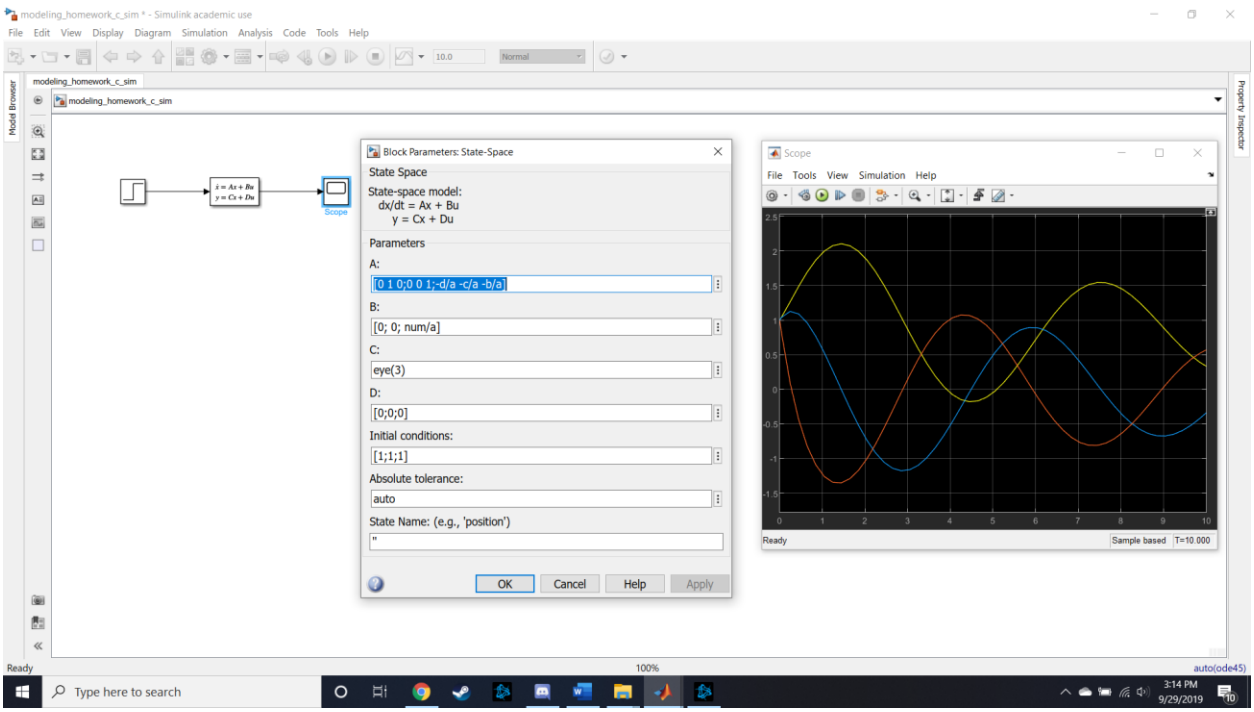



MATLAB R2019a - academic use
HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
Search Documentation
Sign In
New
Open
Save
Find Files
Compare
Print
Go To
Find
Insert
Comment
Indent
Breakpoints
Run
Run and Advance
Run Section
Advance
Run and Time
C: ▸ Users ▸ jdold ▸ OneDrive ▸ Documents ▸ MATLAB ▸
Current Folder
Name
slprj
dynamics.m
modeling_homework_a.asv
modeling_homework_a.m
modeling_homework_a_sim.slx
modeling_homework_a_sim.slx.autos...
modeling_homework_a_sim.slxc
modeling_homework_b.asv
modeling_homework_b.m
modeling_homework_b_sim.slx
modeling_homework_c.m
modeling_homework_c_sim.slx
modeling_homework_msddyn.m
modelsimulation.slx
modelsimulation.slx.autosave
modelsimulation.slxc
msddyn.m
simulinkexample.slx
simulinkexample.slxc
statespacemsd.m
time_triggers.slx
transfuncmsd.m
ugv_simulation.slx
ugv_simulation.slxc
UGVparameters.m
user_functions.slx
uvsexample1.m
uvsexample2.m
uvsexample3.m
uvsexample4.m
uvsexample5.m
vector_operations.slx
modelsimulation.slx (Simulink Model)
Editor - C:\Users\jdold\OneDrive\Documents\MATLAB\modeling_homework_msddyn.m
modeling_homework_a.m
modeling_homework_b.m
modeling_homework_msddyn.m
modeling_homework_c.m
function xdot=modeling_homework_msddyn(t,x)
a=2;
b=5;
c=3;
d=5;
num = 4;
A=[0 1 0;0 0 1;-d/a -c/a -b/a];
B=[0;0;num/a];
u=1;
%u=0.5*square(pi*t)+0.5;
xdot=A*x+B*u;
Workspace
Name
Value
a 2
A [0,1,0;0,0,1;-2.500...
b 5
B [0;0;2]
c 3
d 5
den [2,5,3,5]
k 25
m 20
msdsyst 1x1 tf
num 4
out 1x1 SimulationO...
t 353x1 double
time [0,60]
u 601x1 double
x 353x3 double
x0 [0;0;0]
xdot [0;0;2]
modeling_homework_msddyn
Ln 16 Col 1
Type here to search
3:10 PM
9/29/2019


modeling_homework_b_sim * - Simulink academic use
File Edit View Display Diagram Simulation Analysis Code Tools Help
modeling_homework_b_sim
Model Browser
Property Inspector
Block Parameters: State-Space
State Space
State-space model:
dx/dt = Ax + Bu
y = Cx + Du
Parameters
A:
[0 1 0;0 0 1;-d/a -c/a -b/a]
B:
[0; 0; num/a]
C:
eye(3)
D:
[0;0;0]
Initial conditions:
[0;0;0]
Absolute tolerance:
auto
State Name: (e.g., 'position')
''
OK
Cancel
Help
Apply
Scope
Scope
File Tools View Simulation Help
Ready
Sample based
T=10.000
Ready
100%
auto(ode45)
Type here to search
3:12 PM
9/29/2019

c)


%State space model of differential equation
time=[0 60];
x0 = [1;1;1];
[t,x]=ode45(@modeling_homework_msddyn,time,x0);
plot(t,x)
Figure 1


Block Parameters: State-Space
State Space
State-space model:
dx/dt = Ax + Bu
y = Cx + Du
Parameters
A:
[0 1 0;0 0 1;-d/a -c/a -b/a]
B:
[0; 0; num/a]
C:
eye(3)
D:
[0;0;0]
Initial conditions:
[1;1;1]
Absolute tolerance:
auto
State Name: (e.g., 'position')
OK
Cancel
Help
Apply
Scope