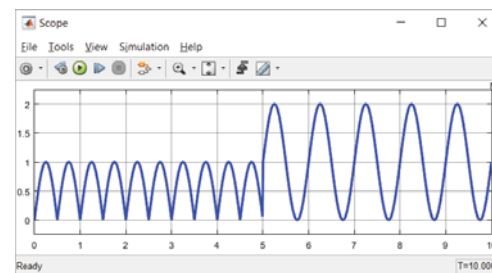
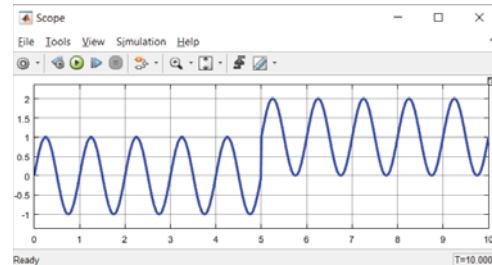
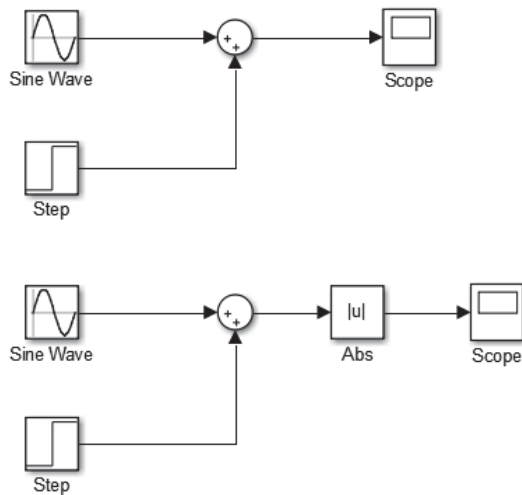


# Introduction to Simulink

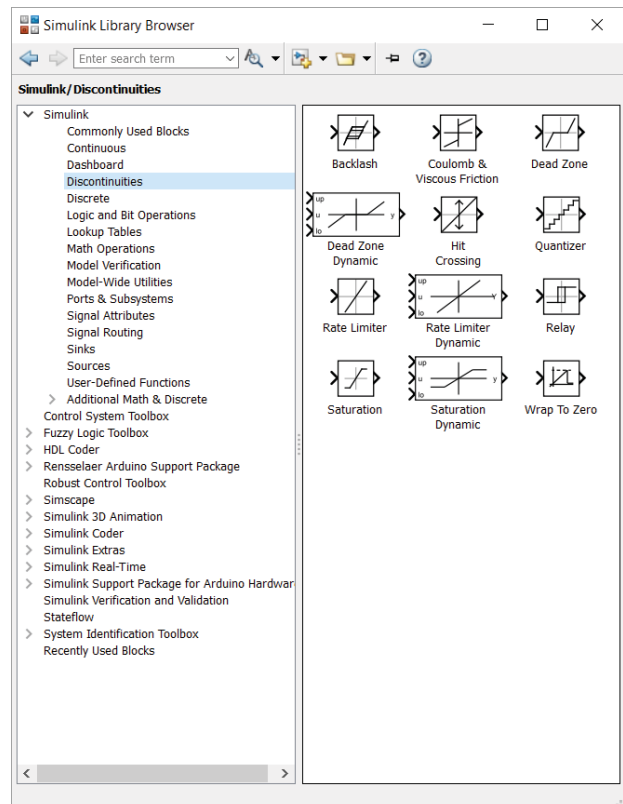
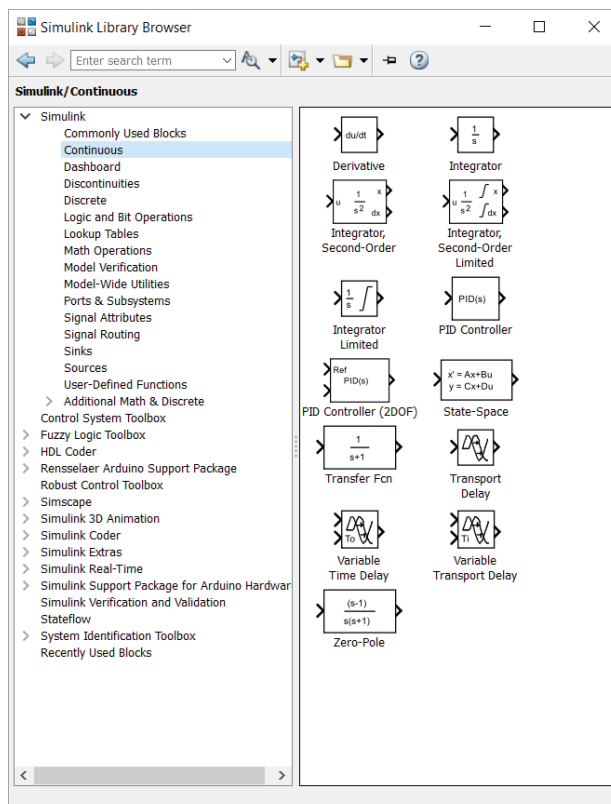
Simulink is MATLAB's graphical simulation environment

We can drag and drop blocks of math functions, operators, excitation inputs, and plotting outlets.

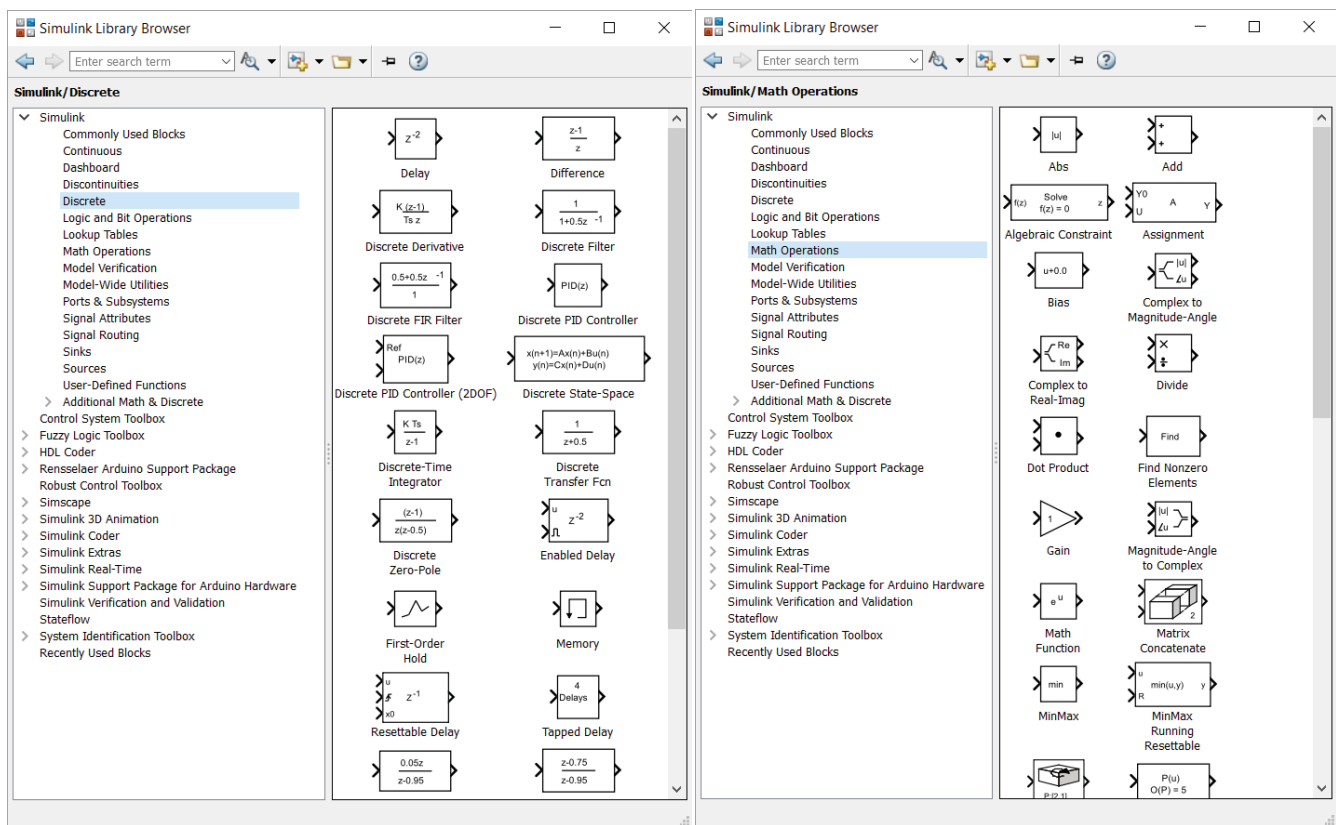
We can simulate sophisticated linear and nonlinear differential equations.



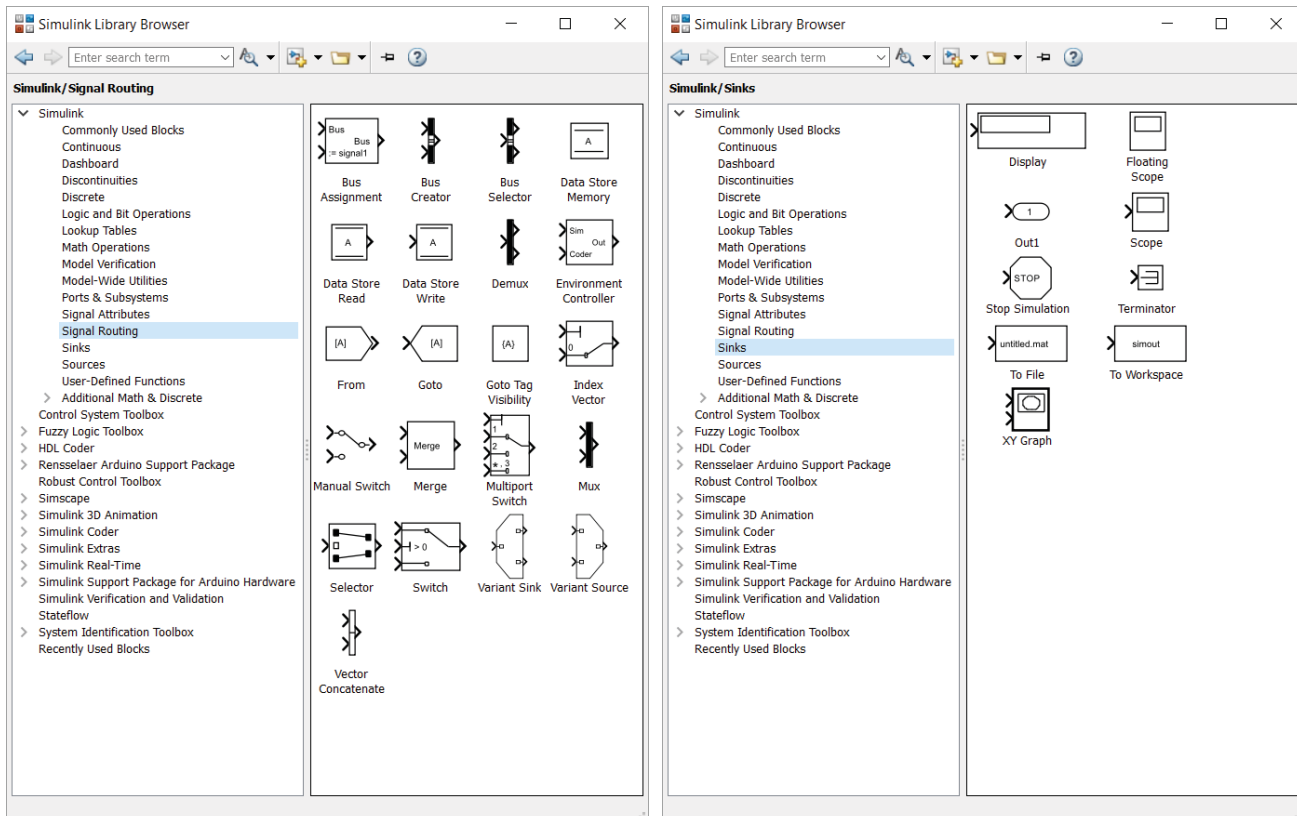
## Simulink's Commonly Used Libraries



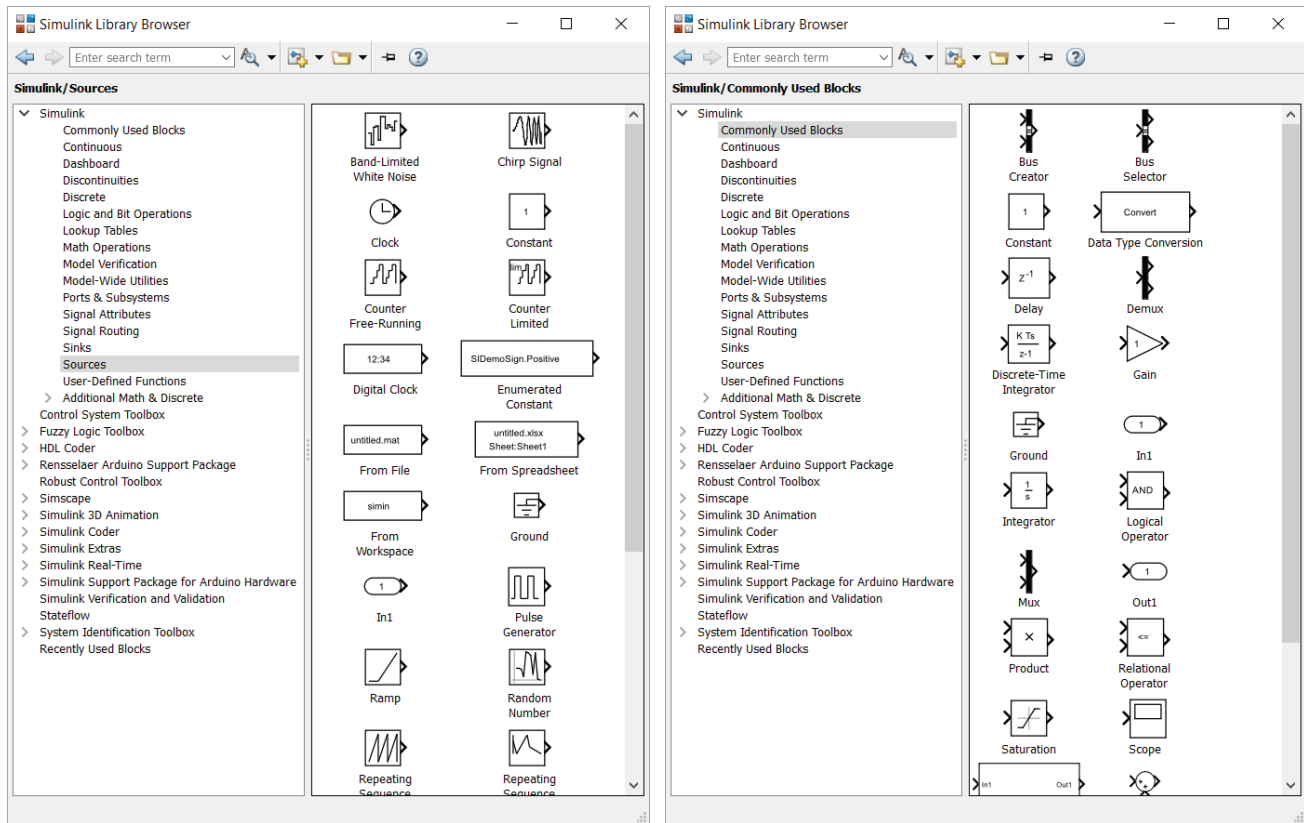
# Simulink's Commonly Used Libraries



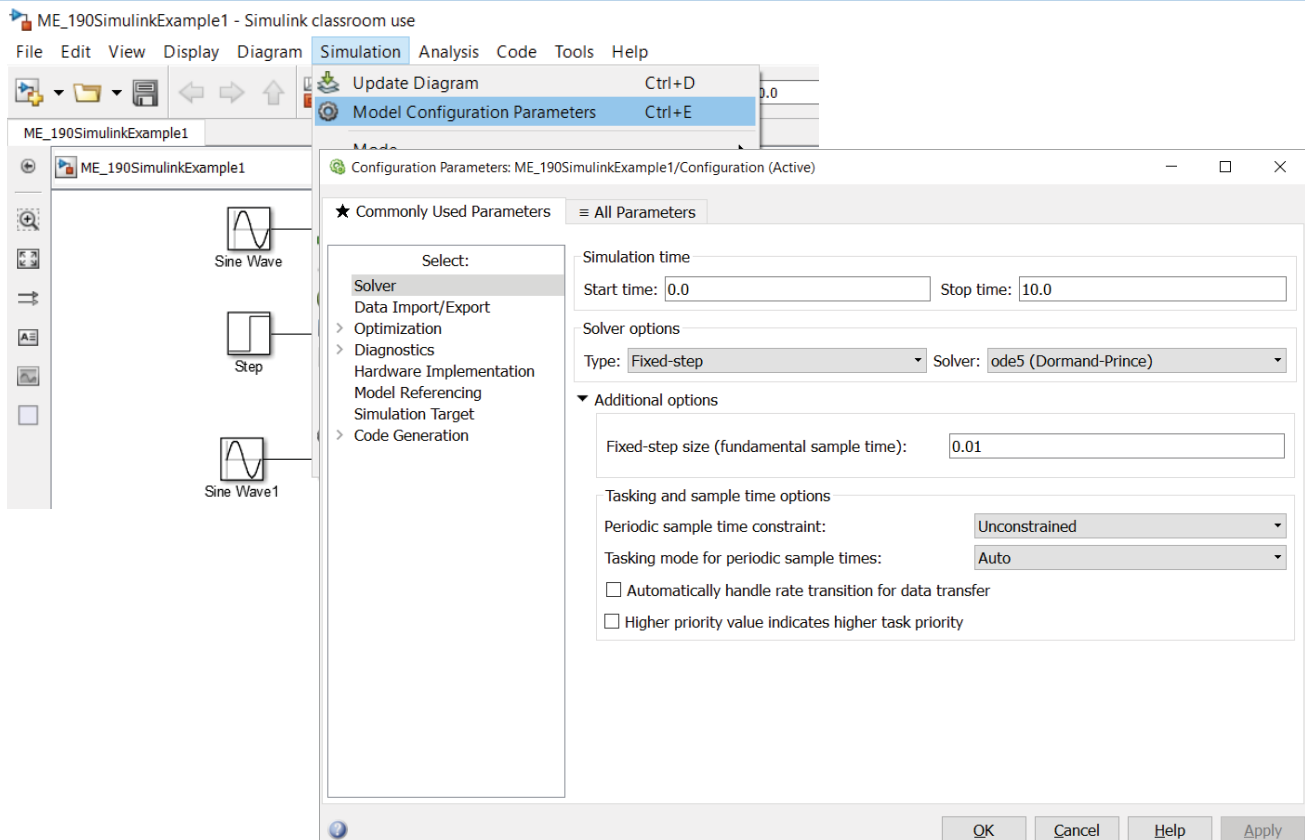
# Simulink's Commonly Used Libraries



# Simulink's Commonly Used Libraries



## Setting Simulation Parameters



# Solving Differential Equations with Simulink

Example: Numerically simulate:

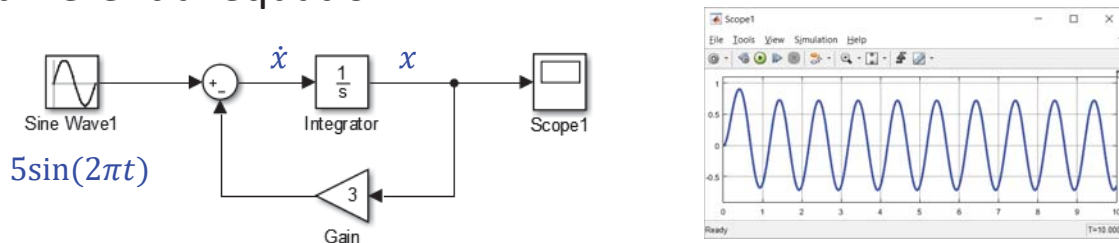
$$\dot{x} + 3x = 5\sin(2\pi t)$$

Procedure:

Keep the largest order derivative term in the left and move all the other terms to the right:

$$\dot{x} = -3x + 5\sin(2\pi t)$$

Use integrator from the Simulink's "Continuous" library and other relevant blocks to create block diagram of the differential equation



# Solving Differential Equations with Simulink

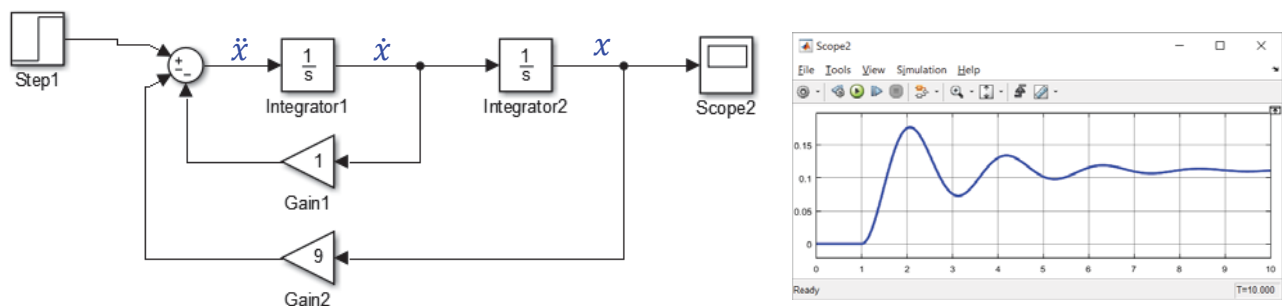
Example 2: Simulate:

$$\ddot{x} + \dot{x} + 9x = u(t)$$

Where  $u(t)$  is the unit step at  $t = 1$  s.

\*Keep the largest order derivative term in the left and move all the other terms to the right:

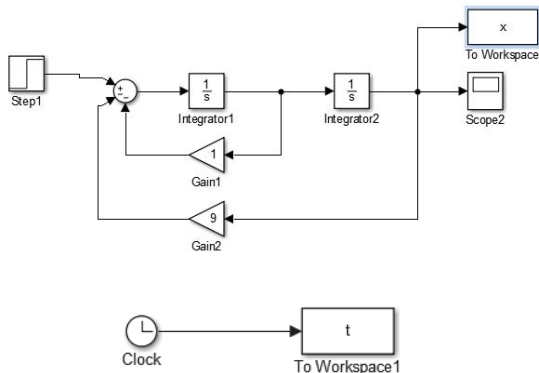
$$\ddot{x} = -\dot{x} - 9x + u(t)$$



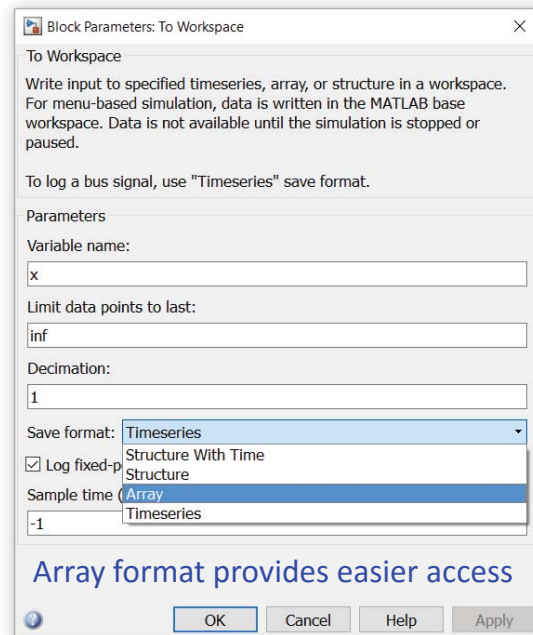
# MATLAB & Simulink Interface

- We can send data from Simulink to Matlab:

Simulink >> Sinks >> To Workspace

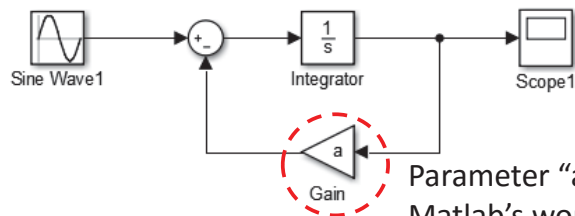


Sending time data to workspace  
Simulink >> Sources >> Clock



# MATLAB & Simulink Interface

- Simulink has access to Matlab's workspace



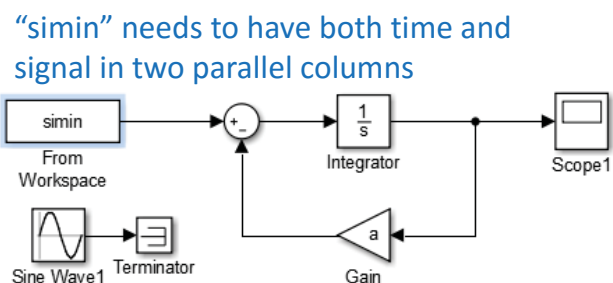
Parameter "a" can be read from  
Matlab's workspace

- We can run a Simulink model from Matlab using "sim" command.

```
>> sim('filedirectory\filename.slx')
```

- We can send data from Matlab to Simulink:

Simulink >> Sources >>  
From Workspace



"simin" needs to have both time and  
signal in two parallel columns