# Introduction to MATLAB®

## Scripts and Functions

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- Commands entered in the Command Window cannot be saved and executed again for several times.
- Therefore, a different way of executing these commands is to create a file with these commands and then run this file every time we need to run the same operation.
- There are two different ways to do this :
  1. M-file Scripts
  2. M-file Functions

# M-file scripts

- A *script file* is an external file that contains a sequence of MATLAB statements. Script files have a filename extension **.m** and are often called M-files.
- M-files *scripts* simply execute a series of MATLAB statements.

# Script Examples

1. mySphere.m
2. mySin2d.m
3. mySin2d_loop.m
4. compund_script.m
5. compund_script_loop.m

# M-file function

- **functions** are programs (or *routines*) that **accept *input*** arguments and **return *output*** arguments.
- Each M-file function (or *function* or *M-file* for short) has its *own* area of workspace, separated from the MATLAB base workspace.
- have a filename extension **.m**

# Function Examples

1. Factorial.m
2. Average.m

| Scripts | Functions |
| --- | --- |
| Do not accept input arguments or return output arguments. | Can accept input arguments and return output arguments |
| Store variables in a workspace that is shared with other scripts | Store variables in a workspace internal to the function |
| Are useful for automating a series of commands | Are useful for extending the MATLAB language for your application |

# Engineering Applications

# Solving algebraic expression

1. function  solve.m
2. specvol.m
3. mulEq.m

# Solving ODEs

1. simple_ode_solver.m

2. simple_sim_solver.m

# Irreversible reaction in series

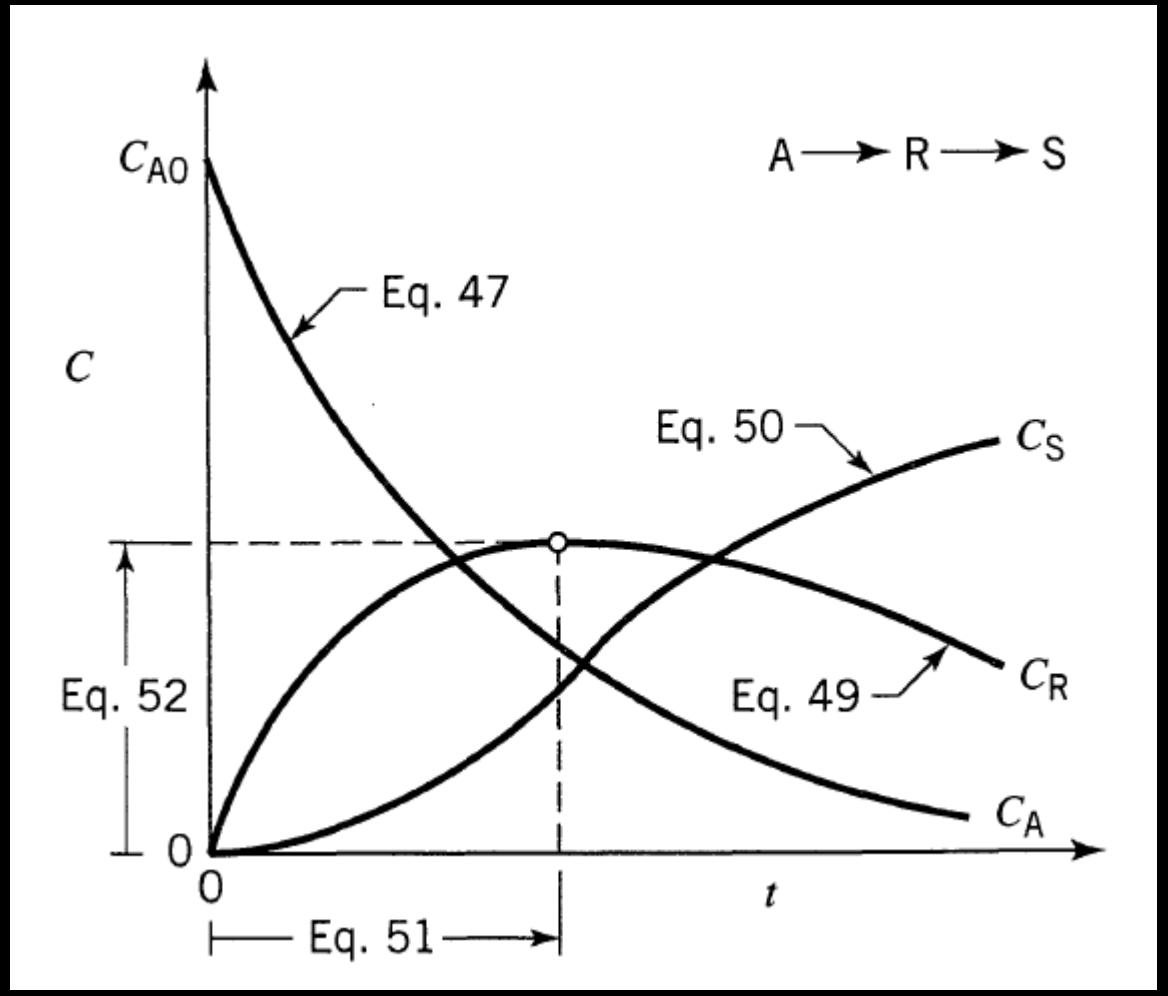
A → R → S

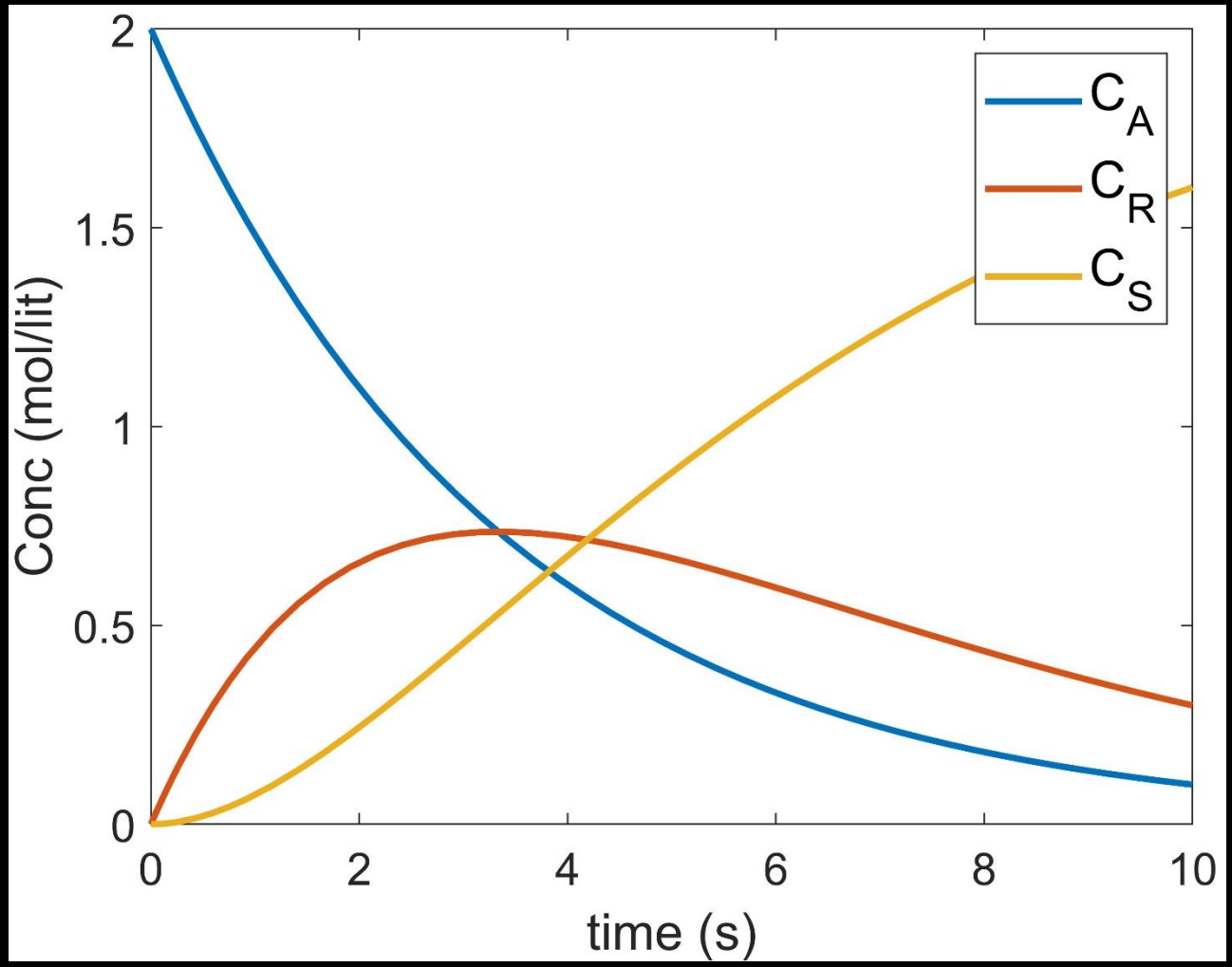
$$r_A = \frac{dC_A}{dt} = -k_1 C_A$$

$$r_R = \frac{dC_R}{dt} = k_1 C_A - k_2 C_R$$

$$r_S = \frac{dC_S}{dt} = k_2 C_R$$

irreversible_solver.m


$C_{A0}$
A → R → S
Eq. 47
C
Eq. 50
$C_S$
Eq. 52
Eq. 49
$C_R$
$C_A$
0
0
t
Eq. 51


2
1.5
1
0.5
0
Conc (mol/lit)
0
2
4
6
8
10
time (s)
$C_A$
$C_R$
$C_S$

# Numerical Integration

1. integ_example1.m
2. integ_example2.m

# Average velocity of a fluid – Steady state laminar flow

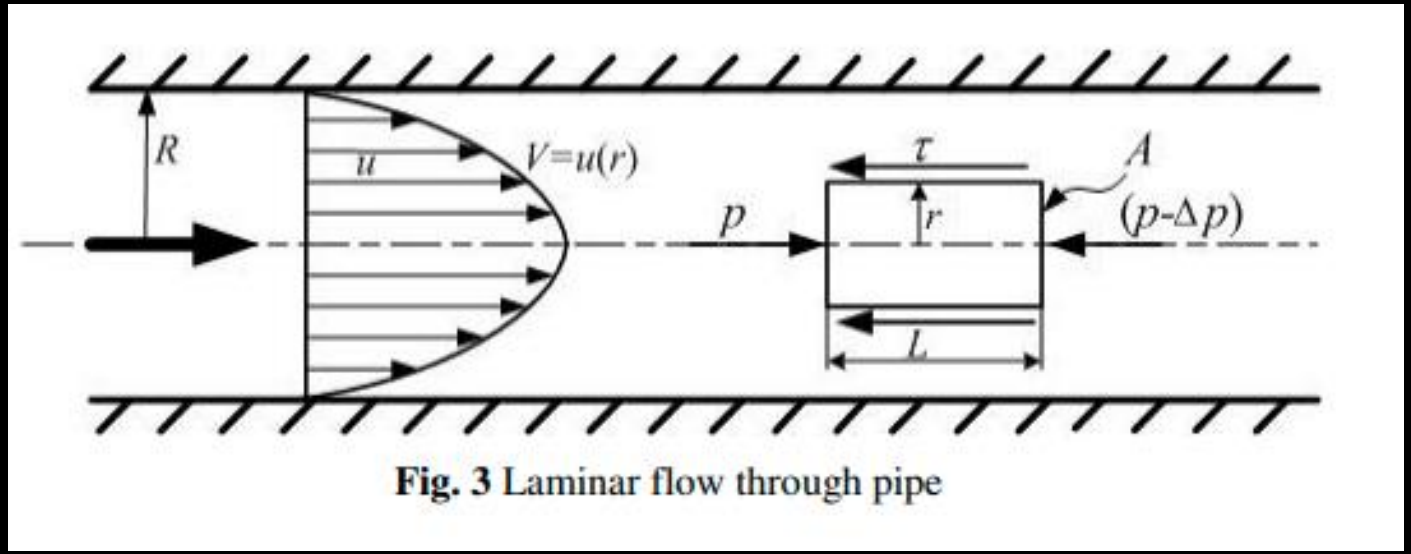



**Fig. 3** Laminar flow through pipe

$$u(r) = \left(\frac{\Delta p D^2}{16 \mu L}\right)\left\{1 - \left(\frac{2r}{D}\right)^2\right\}.$$

Velocity Profile

$$V = \frac{\Delta p D^2}{32 \mu L}.$$

Average velocity - analytical

$$V_{avg} = \frac{2}{R^2}\int_0^R u(r) r dr$$

Average velocity - integration

laminar.m

# Curve Fitting

1. straight  line.m
2. exponential.m
3. GUI examples for curve fitting.
4. Readtable  excel


THANK YOU