Contents


```
% Revised:
%       August 25, 2015

% Purpose
%       This program will demonstrate the appropriate format to be
%       used for submissions. This is not a MATLAB tutorial. In addition,
%       it demonstrates finding the flow rate in a pipe when
%       the velocity vs radius data is given.

% Keyword
%       Sample
%       Format

% Author
%       Autar Kaw
%       Semester: Fall 2015

clc
clf
clear all
disp ('Computational Methods')
disp ('EML3041')
disp ('Fall 2015')
disp ('Autar Kaw')
disp('Project Name: Flow rate in a pipe')
disp('*******************************************************************')
disp('  ')
```

```
Computational Methods
EML3041
Fall 2015
Autar Kaw
Project Name: Flow rate in a pipe
*******************************************************************
```

General Guidelines

```
%1) publish the m file in HTML format
```

```
%2) sufficient comments should be used so someone else can
%   understand your program
```

Problem 1

```
%EXAMPLE OF PROPER TABLE FORMAT

%>> each problem should be separated by this divider.
%HINT: Don't forget the space after the %%!

%INPUTS
% Attached is the handwritten data taken in the lab
% radial location data
radial =   [0  0.083  0.17  0.25  0.33  0.42  0.5];
% velocity data
velocity= [10  9.72   8.88  7.5     5.6      3.1    0];
%>> for tables, you only need to display the problem number as shown below

%CODE
disp ('Problem 1')
disp('_________________________________')
disp('   Radius (in)    Velocity (ft/s)' )
disp('_________________________________')
dataval=[radial;velocity]';
disp(dataval)
disp('_________________________________')
disp ('  ')

%OUTPUTS
%See table

%for problems not requiring clearly defined outputs (e.g. displaying data
%in a table), make a note similar to the one seen above.
```

```
Problem 1
_________________________________
   Radius (in)    Velocity (ft/s)
_________________________________
         0   10.0000
    0.0830    9.7200
    0.1700    8.8800
    0.2500    7.5000
    0.3300    5.6000
    0.4200    3.1000
    0.5000         0

_________________________________
```

Problem 2

```
%EXAMPLE OF A CALCULATION PROBLEM
```

```
%>> each problem should be divided with comments as follows:
%   INPUTS, CODE, and OUTPUTS. You should NOT use %% for these
%   divisions.

%>> if you have already entered the INPUT data for a previous problem,
%   reference the variable names as a comment here. Example is as follows.

%INPUTS (from Problem 1)
%radial
%velocity

%CODE
% Length of radial location array
n=length(radial);
% Fitting a polynomial of degree 2 to the data
p=polyfit(radial,velocity,2);
syms r %>> DO NOT put comments here
%>> put comments above or below your line of code to get a cleaner
%   look

%OUTPUTS
% Outputting the velocity profile
disp('Problem 2')
%>> the only ways anything should be output to the Command Window
%   is by using 'disp' or 'fprint' commands
fprintf('The velocity profile is %gr^2 + %gr +%g', p(1),p(2),p(3))
disp('   ')
disp('********************************************************************')
disp ('  ')
```

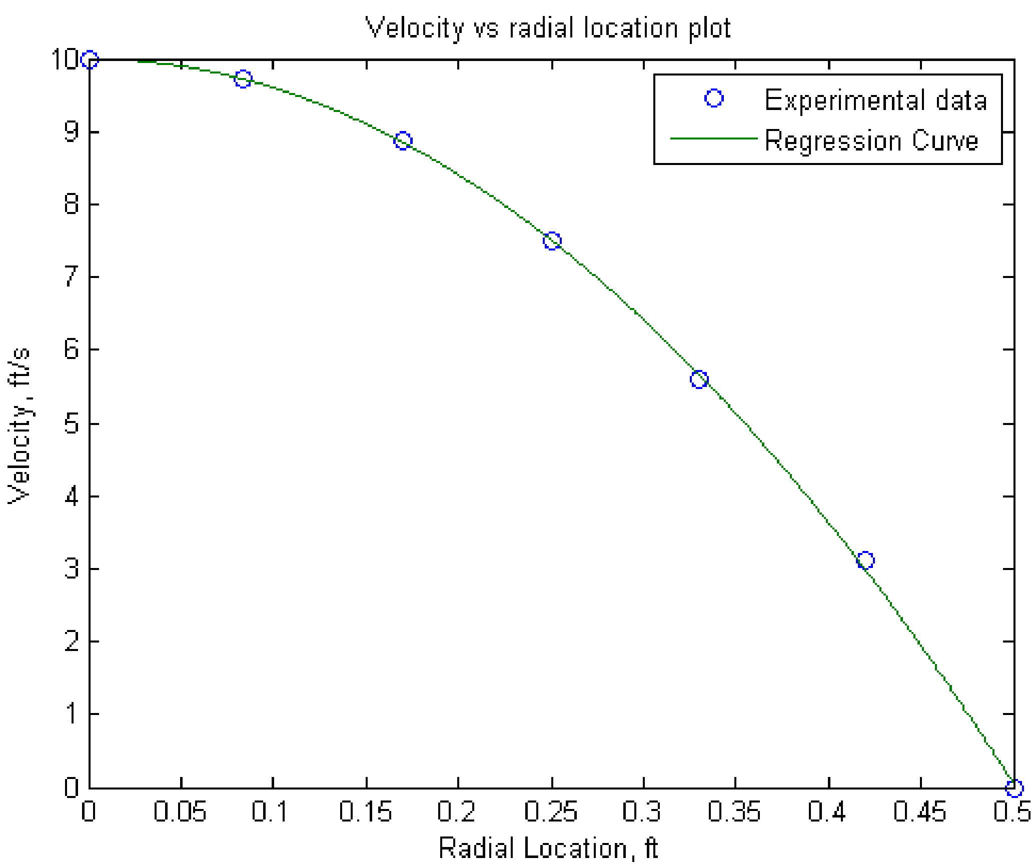
```
Problem 2
The velocity profile is -39.9209r^2 + 0.067263r +9.9965
********************************************************************
```

Problem 3

```
%EXAMPLE OF PROPER FIGURE FORMAT

%INPUTS (from Problem 1)
%radial
%velocity

%CODE
% Plotting velocity vs radial location
r_val=radial(1):(radial(n)-radial(1))/1000:radial(n);
v_val=polyval(p,r_val);

%OUTPUTS
%plotting radial location vs velocity
plot(radial,velocity,'o',r_val,v_val,'-');
%>> if there is more than one plot on the same figure, the plots
%   must have different colors and/or symbols
xlabel('Radial Location, ft')
```

```
ylabel('Velocity, ft/s')
title ('Velocity vs radial location plot')
legend('Experimental data','Regression Curve')
%>> you must use all of the previous figure format elements
disp ('Problem 3')
%>> refer the reader to the appropriate figure for plot problems
disp('See Figure 1')
disp('*********************************************************************')
disp ('  ')
```

```
Problem 3
See Figure 1
*********************************************************************
```



Problem 4

```
%INPUTS
%radial (from Problem 1)
%p (from Problem 2)

%CODE
% Finding the flow rate from the regression curve
% Velocity profile
vel_profile=p(1)*r^2+p(2)*r+p(3);
% Integrating to find the flow rate
flow_rate=int(2*pi*r*vel_profile,r,radial(1),radial(n));
```

```
flow_rate=double(flow_rate);

%OUTPUTS
disp('Problem 4')
%>> Use '...' to avoid cut off errors
fprintf ('The flow rate from the regression curve is=  %g  ft^3/s',...
    flow_rate)
disp('  ')
disp('********************************************************************')
disp ('  ')
```

```
Problem 4
The flow rate from the regression curve is=  3.94962  ft^3/s
********************************************************************
```

Problem 5

```
%EXAMPLE OF A CALCULATION PROBLEM

%INPUTS (from Problem 1)
%velocity
%radial

%CODE
% Finding the flow rate from the average velocity x Area method
% Average Velocity
avg_vel=mean(velocity);
% Integrating to find the flow rate
flow_rate=avg_vel*pi*radial(n)^2;
flow_rate=double(flow_rate);

%OUTPUTS
disp('Problem 5')
fprintf('The flow rate from the average velocity method is=  %g  ft^3/s',...
    flow_rate)
disp('  ')
disp('********************************************************************')
disp ('  ')
```

```
Problem 5
The flow rate from the average velocity method is=  5.02655  ft^3/s
********************************************************************
```

Problem 6

```
%EXAMPLE OF A CALCULATION PROBLEM

%INPUTS (from Problem 1)
%velocity
```

```
%radial

%CODE
% Using trapezoidal rule with unequal segments to find flow rate
flow_rate_alt=0;
for i=1:1:n-1
    fun_up=2*pi*radial(i+1)*velocity(i+1);
    fun_low=2*pi*radial(i)*velocity(i);
    flow_annulus=(radial(i+1)-radial(i))/2*(fun_up+fun_low);
    flow_rate_alt=flow_rate_alt+flow_annulus;
end

%OUTPUTS
disp('Problem 6')
disp('Using trapezoidal rule with unequal segments to find flow rate')
fprintf ('The flow rate from an alternative method is=  %g  ft^3/s',...
    flow_rate_alt)
disp('  ')
disp('********************************************************************')
disp ('  ')
```

```
Problem 6
Using trapezoidal rule with unequal segments to find flow rate
The flow rate from an alternative method is=  3.84767  ft^3/s
********************************************************************
```

Published with MATLAB® R2013b