Problem 1: Solution

clear
clc
close all

disp('Urban Meyer, Seat #01');
disp('ENGR 1181');
disp('Practice Problem 1');
disp('AU 14 Prof: Woody Hayes');
disp('12/1/14');

t = (0:0.01:10); % forms "t" array from 0 to 10 in increments of 0.01
tau = 3; % defines constant "tau"
f = 0.5; % defines natural frequency in Hz
V_step = 5; % defines step input voltage of 5 V
V_step_array = zeros(1,length(t))+5;
% creates array same length as t to properly plot 5V as line
Vrc = V_step*(1-exp(-t/tau)); % calculates Vrc and Vrlc
Vrlc = V_step*(1-exp(-t/tau).*cos(2*pi*f*t));

plot(t,V_step_array,t,Vrc,t,Vrlc); % plots and labels the graph
xlabel('Time (s)');
ylabel('Voltage (V)');
title('RC Circuit and RLC Circuit Response to Step-function Input');
legend('Input Voltage','Vrc','Vrlc');
Problem 2: Solution

clear
clc
close all

disp('Urban Meyer, Seat #01');
disp('ENGR 1181');
disp('Practice Problem 2');
disp('AU 14 Prof: Woody Hayes');
disp('12/1/14');

x = (0:1:50); % forms "x" array from 0 to 50 in increments of 1
y_0 = zeros(1,length(x))+100;
% creates values for length of x to properly plot as line
y_1 = x.^2 - 50*x + 400;
% calculates y_1 requiring only one dot operator for exponentiation.
y_2 = x.^3/25 - 3*x.^2 + 59*x - 229;
% calculates y_2 requiring two dot operators for exponentiation.

plot(x,y_0,x,y_1,x,y_2); % plots and labels the graph
xlabel('X Array (unitless)');
ylabel('Y Values (unitless)');
title('Three Function Plot Versus x Array Input.');
legend('y_0','y_1','y_2');
Problem 3: Solution

clear
clc
close all

disp('Urban Meyer, Seat #01');
disp('ENGR 1181');
disp('Practice Problem 3');
disp('AU 14 Prof: Woody Hayes');
disp('12/1/14');

delta_x = 1e-4;
x = (0:delta_x:pi); % forms "x" array from 0 to pi in increments of 0.0001
y = sin(x);
% creates values for sin(x)
sum = 0;
for i = 1:length(x)
    sum = sum + y(i)*delta_x; % calculates the area under the curve
end

fprintf('The approximated area under the sine curve from 0 to pi is 
%.4f\n',sum);
% prints the area calculated

plot(x,y); % plots and labels the graph
xlabel('X Array (unitless)');
ylabel('Y Values (unitless)');
The approximated area under the sine curve from 0 to pi is 2.0000

Problem 4: Solution

clear
clc
close all
disp('Urban Meyer, Seat #01');
disp('ENGR 1181');
disp('Practice Problem 4');
disp('AU 14 Prof: Woody Hayes');
disp('12/1/14');
t = (0:1e-3:20); % forms "t" array from 0 to 20 seconds in increments of 0.001
y = 2.3*sin(2*t).*exp(-t/5)+2; % calculates values for y from t

range_1 = 0; % initializes counters for each range
range_2 = 0;
range_3 = 0;
range_4 = 0;
for i = 1:length(y) % searches y for values within each listed range
    if y(i) >= 0 && y(i) <= 1
        range_1 = range_1 + 1; % keeps count of number of values within each range
    elseif y(i) > 1 && y(i) <= 2
        range_2 = range_2 + 1;
    elseif y(i) > 2 && y(i) <= 3
        range_3 = range_3 + 1;
    elseif y(i) > 3 && y(i) <= 4
        range_4 = range_4 + 1;
    end
end

fprintf('There are %i elements in y between 0 and 1\n',range_1); % prints all four counts
fprintf('There are %i elements in y between 1 and 2\n',range_2);
fprintf('There are %i elements in y between 2 and 3\n',range_3);
fprintf('There are %i elements in y between 3 and 4\n',range_4);

plot(t,y); % plots actual function with labels
xlabel('Time (s)');
ylabel('Y-Output (unitless)');
title('Function of Y versus Time');

Urban Meyer, Seat #01
ENGR 1181
Practice Problem 4
AU 14 Prof: Woody Hayes
12/1/14
There are 802 elements in y between 0 and 1
There are 8624 elements in y between 1 and 2
There are 9219 elements in y between 2 and 3
There are 1356 elements in y between 3 and 4
>>
Problem 5: Solution

clear
clc
close all

disp('Urban Meyer, Seat #01');
disp('ENGR 1181');
disp('Practice Problem 5');
disp('AU 14 Prof: Woody Hayes');
disp('12/2/14');

N = input('Assign a value to the variable "N": ');
N_fact = 1;

for i = 2:N % loops through all numbers up to "N" to calculate factorial
    N_fact = N_fact*i; % calculates the factorial number by number
end

disp(N_fact); % displays factorial answer

Problem 6: Solution

clear
clc
close all

disp('Urban Meyer, Seat #01');
disp('ENGR 1181');
disp('Practice Problem 6');
disp('AU 14 Prof: Woody Hayes');
disp('12/2/14');
cycles = 0; % sets the cycle counter to zero
 tic % initializes the clock
 while toc <= 10 % runs for 10 seconds
     cycles = cycles + 1; % increments the cycle count
     speed = cycles/toc; % calculates the current time average looping speed
     fprintf('MATLAB is running at %.4f cycles/s \n',speed); % prints the speed
to the screen
 end

1) A plot is created by: `plot(time,velocity,time,distance,time,acceleration)`. Write a single command to create a proper legend with labels DISTANCE, VELOCITY and ACCELERATION which corresponds to the generated plot.

   `legend('DISTANCE','VELOCITY','ACCELERATION');`

2) Write a single command to plot vector Distance as a function of vector Time. The plot produced should contain dashed red lines and no markers.

   `plot(Time,Distance,'--r');`

3) Given that x=[1 2 3 4; 5 6 7 8; 9 10 11 12] has been assigned, what would be the result of y=x(2:3,[1 2 4])?

   `y = [5 6 8; 9 10 12]`

4) Given a 10 by 3 matrix M, write a single command that extracts all members of the 3rd column of matrix M and assigns it to a vector called M_col_3 using the colon operator.

   `M_col_3 = M(:,3);`

The current flowing in the circuit is most nearly:

   a. 0.050 A
   b. 0.500 A
   c. 0.588 A
   d. None of the above.
5) Given that \( \mathbf{x} = [3 \ 6 \ 9] \) has been executed in the command window, what is the command necessary to evaluate the expression \( x \left( \frac{2 + x}{2 - x} \right)^{\frac{1}{3}} \)? (You must use only the necessary dot operators)

\[
x.*((2+x)/(2-x)).^(1/3)
\]

6) Given that \( \mathbf{x} = [1:0.1:3] \) has been executed in the command window, what is the command necessary to evaluate the expression \( 2 \cos^2(x) \tan(x^3) / e^x \)? (You must use only the necessary dot operators)

\[
2*cos(x).^2.*tan(x.^3)./exp(x)
\]

7) Given the function definition below, which variables are the input variables?

function \( [z] = \text{primenumber}(x,y) \)

\( x \) and \( y \)

8) Given the function definition below, what should the function file name be?

function \( [z] = \text{primenumber}(x,y) \)

\text{primenumber.m}

9) Given the function definition below, can you use “x” as written within the main script file?

function \( [z] = \text{primenumber}(x,y) \)

No, the variable \( x \) within the function file is separately defined from what is used in the main script file.