UNIVERSIDAD POLITÉCNICA PUERTO RICO

Computer Science

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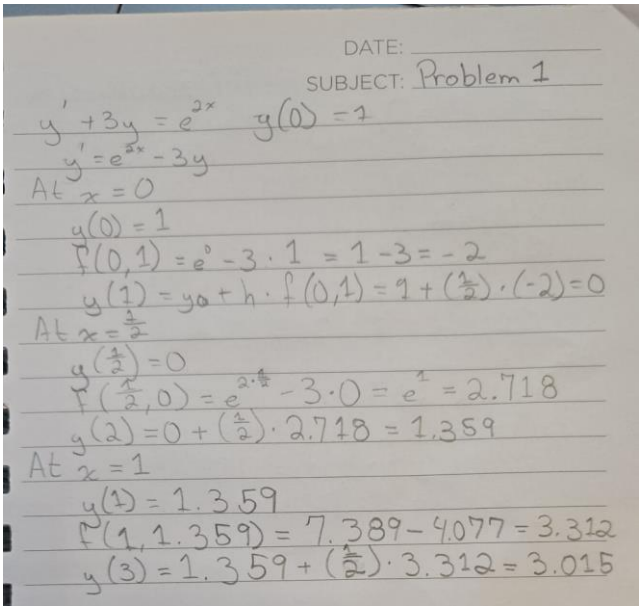
#148830

Numerical analysis for computer science mayors

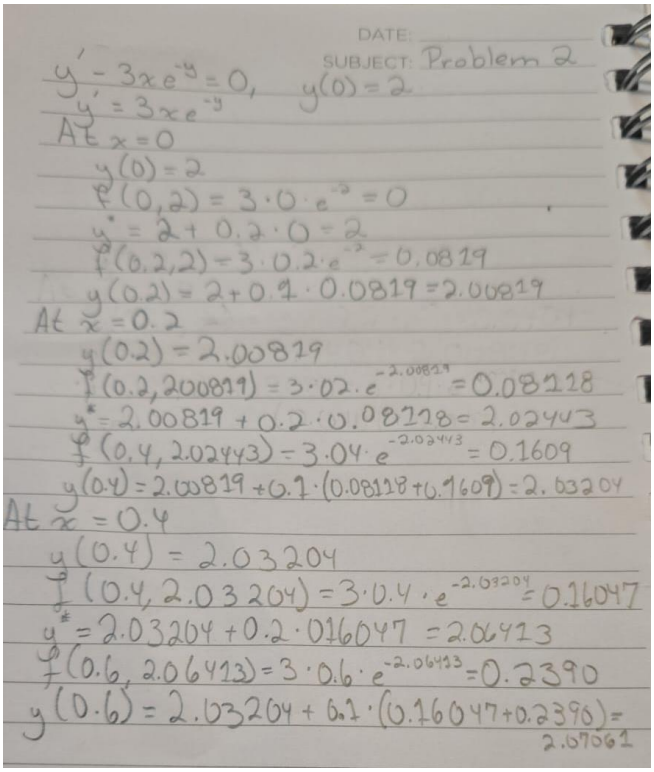
FA 2024 CS3010-80

Assignment Problems

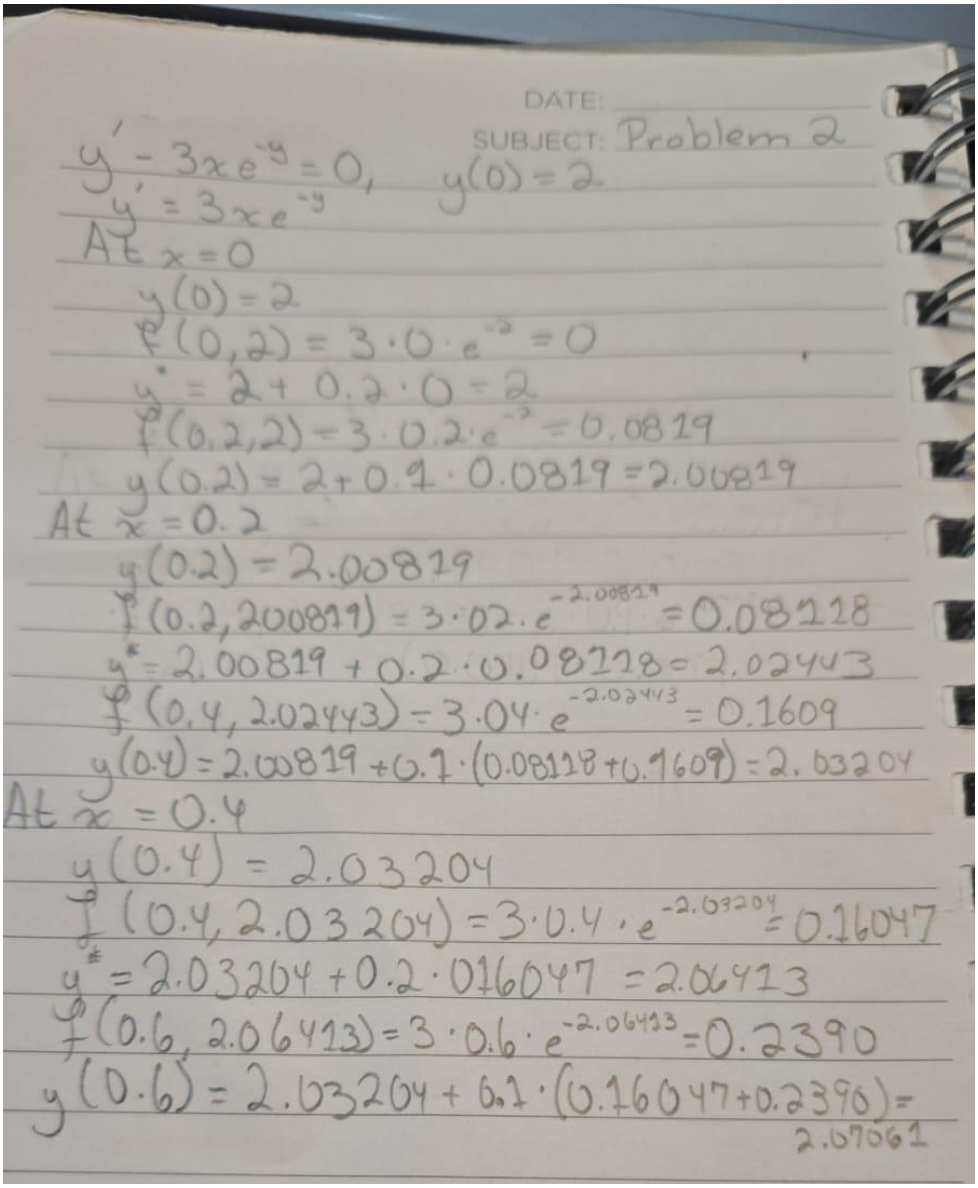
1. Use Euler's method with step size h=1/2 to estimate the value ax x=3/2 of the solution to $y' + 3y = e^{2x}$ such that y (0) =1.



2. Use Modified Euler's Method to approximate the solution of y (0.6) of $y' - 3xe^{-y} = 0$ using h=0.2 and y (0)=2.

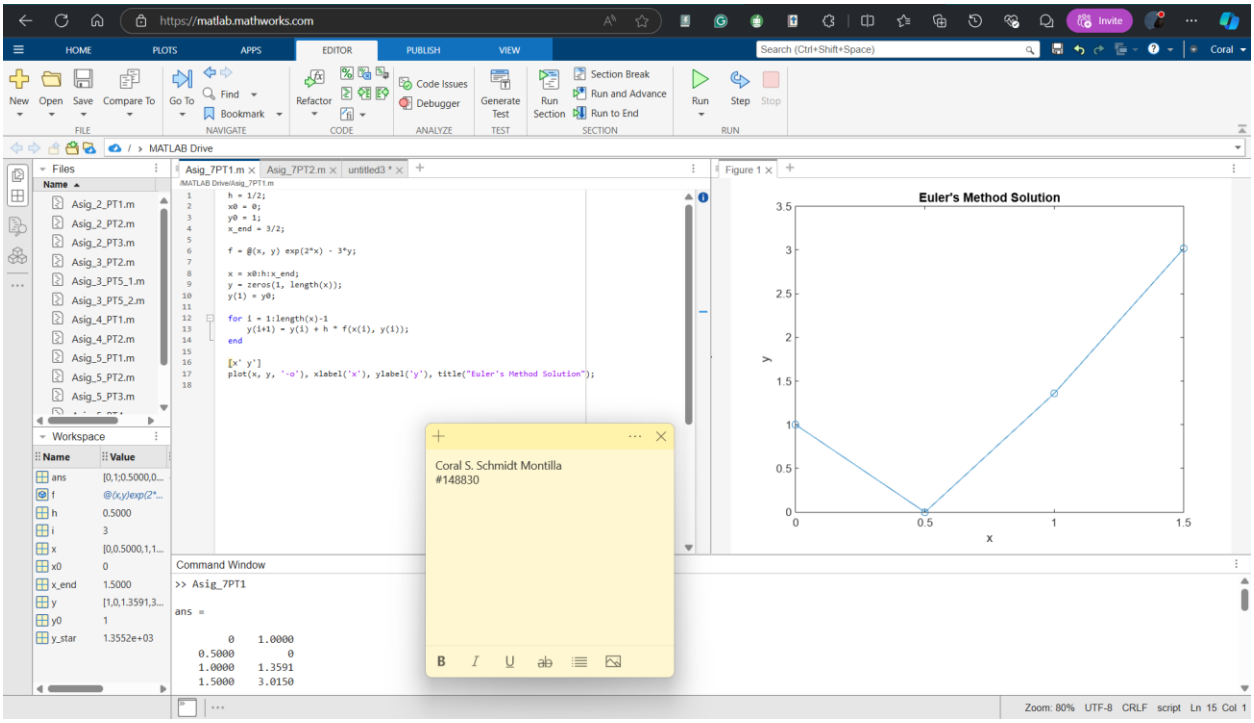


3. Apply the Taylor series up to the fourth derivative to approximate y (1) for the following ODE, $y' + \cos(x)\, y = 0$ with y(0)=1 and h=0.5.

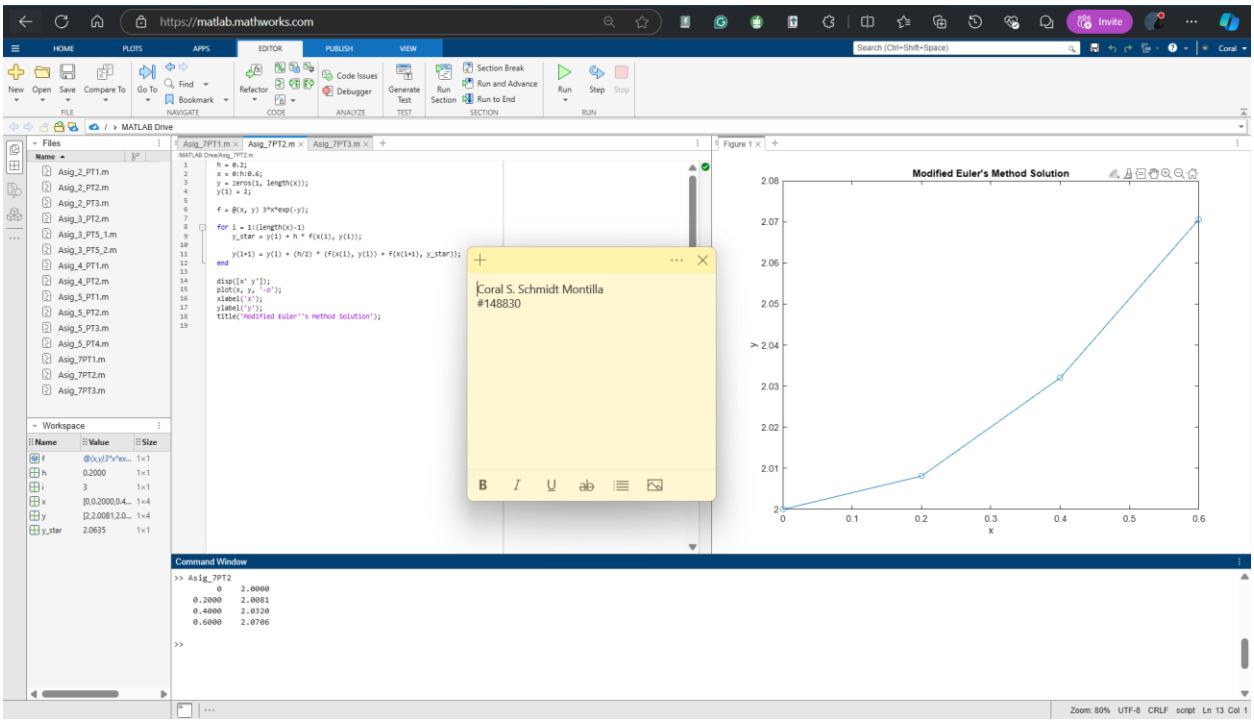


4. Corroborate your previous problems solution using MATLAB. Add to the pdf file the MATLAB output for each of the problems.

Problem 1:



Problem 2:



Problem 3:

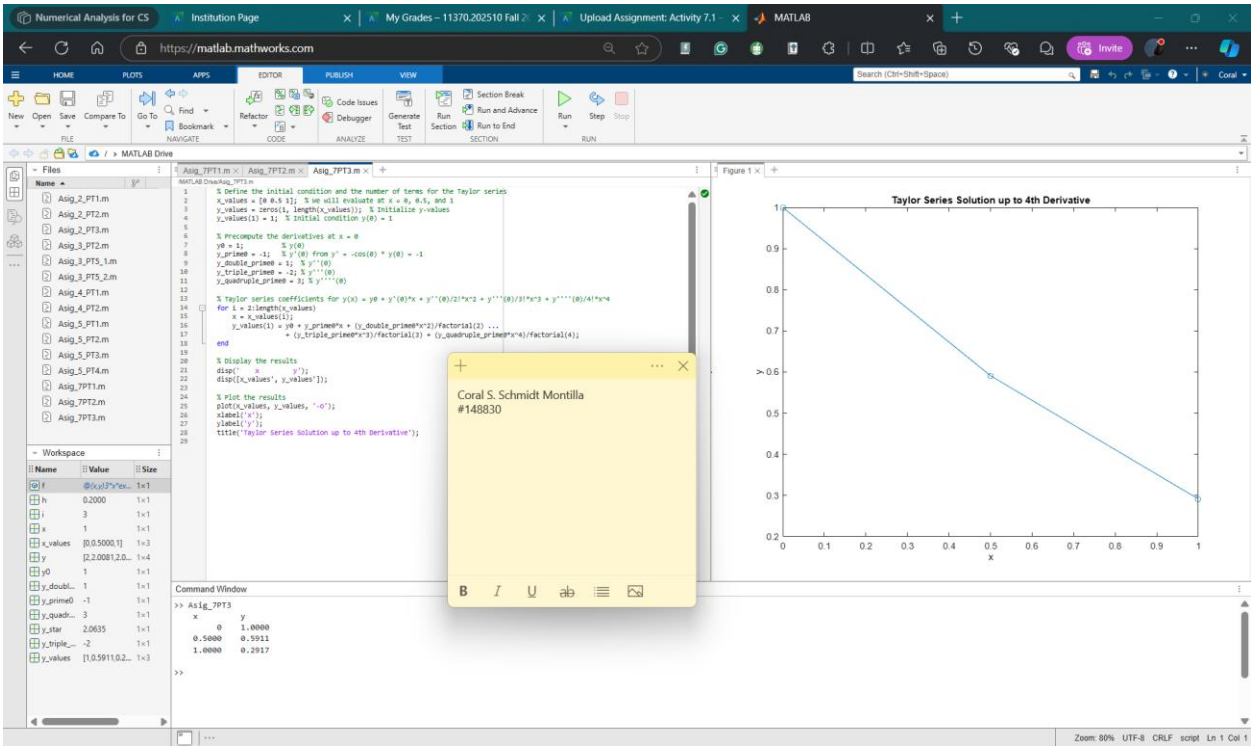

Numerical Analysis for CS
Institution Page
My Grades – 11370.202510 Fall 2
Upload Assignment: Activity 7.1
MATLAB
https://matlab.mathworks.com
Invite
HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
MATLAB Drive
Files
Asig_7PT1.m
Asig_7PT2.m
Asig_7PT3.m
Workspace
% Define the initial condition and the number of terms for the Taylor series
x_values = [0 0.5 1]; % We will evaluate at x = 0, 0.5, and 1
y_values = zeros(1, length(x_values)); % Initialize y-values
y_values(1) = 1; % Initial condition y(0) = 1
% Precompute the derivatives at x = 0
y0 = 1; % y(0)
y_prime0 = -1; % y'(0) from y' = -cos(0) * y(0) = -1
y_double_prime0 = 1; % y''(0)
y_triple_prime0 = -2; % y'''(0)
y_quadruple_prime0 = 1; % y''''(0)
% Taylor series coefficients for y(x) = y0 + y'(0)*x + y''(0)/2!*x^2 + y'''(0)/3!*x^3 + y''''(0)/4!*x^4
for i = 2:length(x_values)
x = x_values(i);
y_values(i) = y0 + y_prime0*x + (y_double_prime0*x^2)/factorial(2) ...
+ (y_triple_prime0*x^3)/factorial(3) + (y_quadruple_prime0*x^4)/factorial(4);
end
% Display the results
disp(' x y');
disp([x_values', y_values']);
% Plot the results
plot(x_values, y_values, '-o');
xlabel('x');
ylabel('y');
title('Taylor Series Solution up to 4th Derivative');
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Figure 1
Taylor Series Solution up to 4th Derivative
y
x
Command Window
>> Asig_7PT3
x y
0 1.0000
0.5000 0.5911
1.0000 0.2917
Zoom: 80% UTF-8 CRLF script Ln 1 Col 1