CEE451 Coding Problem 3

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```
a)
clear;
clc;
syms k x y;
f = -k*sqrt(y)/log(x+1);
f1 = subs(f, k, 0.25);
f2 = subs(f, k, 0.5);
method1 = @euler;
method2 = @predictor;
%% useing euler
disp('delta = 0.001 is chosen. ');
disp('Using euler method');
N = f1 = grid(method1, f1, 1, 5, 4, 0.001);
N m1 f2 = grid(method1, f2, 1, 5, 4, 0.001);
% [y1 euler, x1 euler] = euler(f1,1,5,4,N m1 f1);
figure(1);
title('Using Euler method for function 1');
hold on;
for i = [2, 4, 6, N m1 f1/2, N m1 f1]
    [y1 euler, x1 euler] = euler(f1,1,5,4,i);
    plot(x1 euler, y1 euler, 'Color', [1,0,i/N m1 f1]);
legend('N = 2', 'N = 4', 'N = 6', 'N = 13', 'N = 26');
xlabel('x'); ylabel('y');
hold off;
% [y2 euler, x2_euler] = euler(f2,1,5,4,N_m1_f2);
figure(2);
title('Using Euler method for function 2');
hold on;
for i = [2, 4, 6, N m1 f2/2, N m1 f2]
    [y2 euler, x2 euler] = euler(f2,1,5,4,i);
    plot(x2 euler, y2 euler, 'Color', [1,0,i/N_m1_f2]);
legend('N = 2', 'N = 4', 'N = 6', 'N = 24', 'N = 48');
xlabel('x'); ylabel('y');
hold off;
%% useing predictor
N m2 f1 = grid(method2, f1, 1, 5, 4, 0.001);
N m2 f2 = grid(method2, f2, 1, 5, 4, 0.001);
% y1 pred = euler(f1,1,5,4,N m2 f1)';
figure(3);
title('Using predictor-corrector method for function 1');
hold on;
```

```
for i = [2, 4, 6, N m2 f1/2, N m2 f1]
                                  [y1 pred, x1 pred] = euler(f1,1,5,4,i);
                                plot(x1 pred, y1 pred, 'Color', [1,0,i/N m2 f1]);
legend('N = 2', 'N = 4', 'N = 6', 'N = 5', 'N = 10');
xlabel('x'); ylabel('y');
hold off;
% y2 pred = euler(f2,1,5,4,N m2 f2)';
figure (4);
title('Using predictor-corrector method for function 2');
hold on;
for i = [2, 4, 5, N m2 f2/2, N m2 f2]
                                 [y2 pred, x2 pred] = euler(f2,1,5,4,i);
                               plot(x2 pred, y2 pred, 'Color', [1,0,i/N m2 f2]);
legend('N = 2', 'N = 4', 'N = 5', 'N = 6', 'N = 12');
xlabel('x'); ylabel('y');
hold off;

♠ MATLAB R2013a

   HOME PLOTS
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  Analyze Code
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N_m1_f2
                                                                                                                            74 -
                                                                                                                                                                      [yz_prea, xz_prea] = euler(Iz,1,5,4,1);
plot(x2 pred, y2 pred, 'Color', [1,0,1/N m2 f2]);
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ₩ N m2 f1
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  12
                                                                                                                                                         end
legend('N = 2', 'N = 4', 'N = 5', 'N = 6', 'N = 12');
xlabel('x'); ylabel('y');
hold off;

% disp('Using predictor correct method');
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               <1x1 sym>
<1x1 sym>
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              @euler
@predictor
<1x1 sym>
                                                                                                                                                               disp('Using predictor correct method');
fprintf(' euler %s %s\n',char(f1), char(f2));
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Command History
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                -legend('N = 2', 'N = 4', 'N
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ⊞-%-- 12/7/2013 1:36 PM --%
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   N_m2_f1
                                                                                                                                     delta = 0.001 is chosen.
                                                                                                                                    Using euler method
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   N_m1_f1
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  Details
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- b) The δ is 0.001.
- c) Plots





