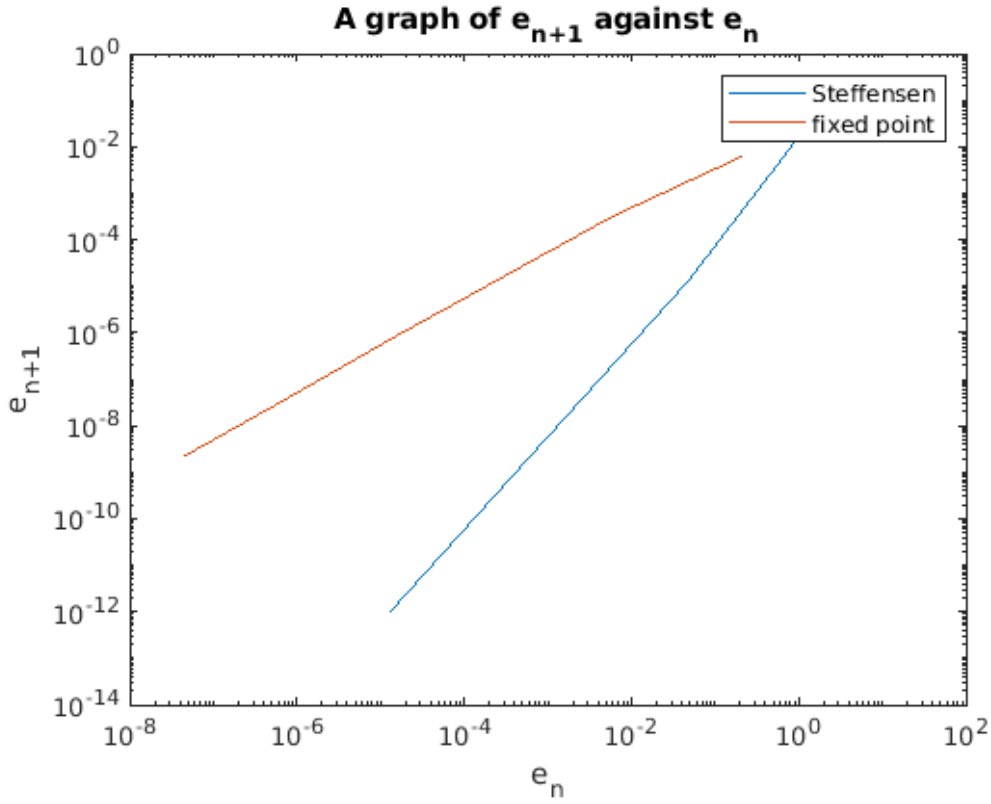
```
%Code accelerates the convergence of a fixed-point algorithm using
%steffensens method.

clear all;
close all;

%tolerance
tol = 1e-8;

%intial guess
x0 = 0.2;

kmax = 100;

%function g(x,y)
g=@(x) (3+3*x-x^2)^(1/3);

fprintf('Below is the solution for the root finding problem;\n');

fprintf('    k          x_k               e_n\n');

[xroot, en] = steffensens(g,x0,tol,kmax)

%Computing e_n
en0 = [];
for k = 1:length(en)-1
   en3 = en(k);
   en0 = [en0,en3];
end

%computing e_n+1
en1 = [];
for k = 2:length(en)
   en2 = en(k);
   en1 = [en1,en2];
end

figure(1);
loglog(en0,en1);
title("A graph of e_n_+_1 against e_n");
ylabel("e_n_+_1");
xlabel("e_n");


slope_steffensens=polyfit(log(en0),log(en1),1);
slope_steffensens = slope_steffensens(1);
fprintf('slope_steffensens = %f\n',slope_steffensens(1));
fprintf('Hence the steffensens is quadratically convergent since its slope is approximately 2.\n');
%fixed point
[en] = fixed_point(g,x0,tol,kmax);

%computing e_n
enf0 = [];
for k = 1:length(en)-1
   en3 = en(k);
   enf0 = [enf0,en3];
end

%computing e_n+1
enf1 = [];
for k = 2:length(en)
   en2 = en(k);
   enf1 = [enf1,en2];
end

 hold on
```

```
loglog(enf0,enf1);
legend('Steffensen','fixed point')

slope_fixed_point=polyfit(log(enf0),log(enf1),1);
slope_fixed_point = slope_fixed_point(1);
fprintf('slope_fixed_point = %f\n',slope_fixed_point(1));
fprintf('Hence the fixed point is linearly convergent since its slope is approximately 1.\n');

%fixed point algorithm
function [en]=fixed_point(g,x0,tol,kmax)

xk = x0;
for k = 1:kmax
    xkp1 = g(xk);
    if abs(xkp1 - xk) < tol
        fprintf('Tolerance achieved\n');
        xroot = xkp1;
        break;
    end
    xk = xkp1;
    en(k) = abs(xkp1 - sqrt(3));
end
%fprintf('\n');
%fprintf('Root is %24.16f\n',xkp1);
%fprintf('Number of iterations : %d\n',k);

end
```

```
Below is the solution for the root finding problem;
    k          x_k                e_n
    1 1.7778344886912885e+00,   1.5778e+00
    2 1.7320380917493903e+00,   4.5796e-02
    3 1.7320508075679841e+00,   1.2716e-05
    4 1.7320508075688774e+00,   8.9329e-13
Tolerance achieved

xroot =

    1.7321


en =

    1.5778    0.0458    0.0000    0.0000

slope_steffensens = 2.086567
Hence the steffensens is quadratically convergent since its slope is approximately 2.
Tolerance achieved
slope_fixed_point = 0.971838
Hence the fixed point is linearly convergent since its slope is approximately 1.
```



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