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% Authors ~
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% This function calculates the minimum/maximum of a single
% variable mathematical function using Newton Raphson Method

% Inputs ~
    %[z ~ Fuction to minimize]
    %[x1 ~ Starting Point]
    %[e ~ threshold value of error]
% Outputs ~
    %[ x2 ~ point corresponding to minimum/maximum]

% Trial run for function
% syms x
% z(x) = x^2 + -5*x + 4
% [x2] = newtonRaphson(z,1,0.001)

function[x2] = newtonRaphson(z,x1,e)
syms x;
z(x) = z;
p=[];
iter = 0;

dz = diff(z,x);
dz_2 = diff(z,x,2);
d =dz/dz_2;
er = 100;
disp('-----')
while(er > e)
    iter = iter +1;
    x2 = double(x1 - d(x1));
    p = [p x2];
    er = (x2-x1)/x1;
    x1 = x2;
    fprintf('After Iteration: %d', iter);
    fprintf('\n')
    fprintf('x:');
    disp(x2);
    fprintf('\n');
    fprintf('Error:');
    disp(er);
    fprintf('\n');
    disp('-----')
end

plot(p,'-o');
fprintf('\n');
fprintf('\n');
fprintf('Solution is: ');
disp(x2);
end

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After Iteration: 1  
x: 1.4727

Error: 0.4727

-----  
After Iteration: 2  
x: 2.0857

Error: 0.4162

-----  
After Iteration: 3  
x: 2.6785

Error: 0.2842

-----  
After Iteration: 4  
x: 2.9632

Error: 0.1063

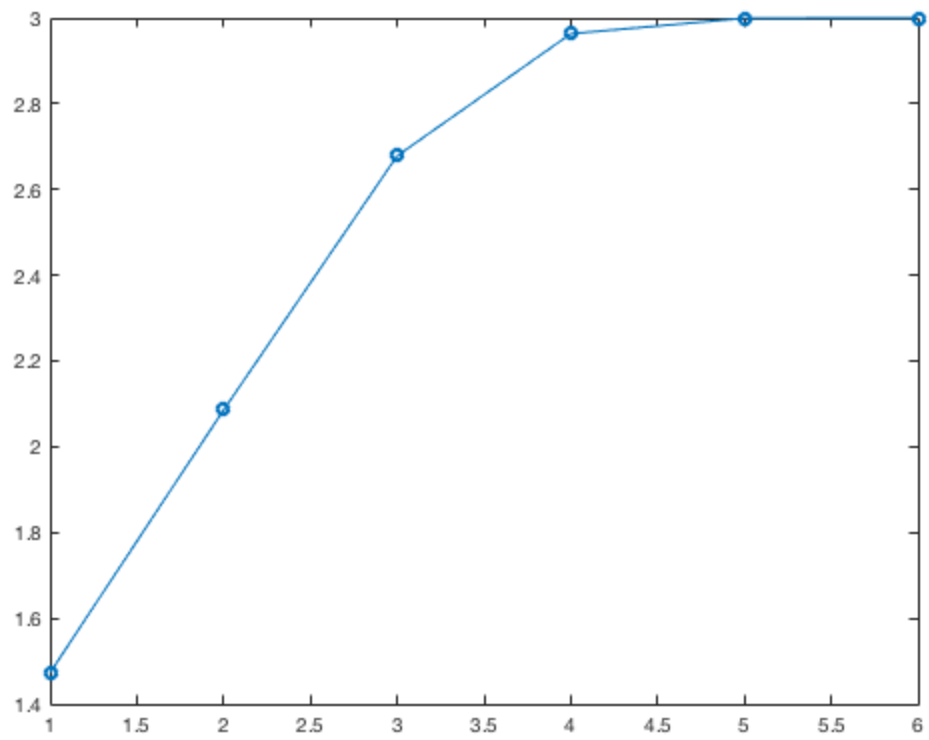
-----  
After Iteration: 5  
x: 2.9995

Error: 0.0122

-----  
After Iteration: 6  
x: 3.0000

Error: 1.5129e-04

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Solution is: 3.0000



*Published with MATLAB® R2017b*