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clear all
close all

%3a). Compute the condition number for values very close to zero.
%condition number
C = @(x) abs((x - (x+1)*log(x + 1))/((x+1)*log(x + 1)));

n = 10;

xl = linspace(-0.05,-0.0000001,n);
xr = linspace(0.0000001,0.05,n);

cl = zeros(n,1);
cr = zeros(n,1);
for i= 1:n
    cl(i) = C(xl(i));
    cr(i) = C(xr(i));
end

%What does the condition number tell you about the stability of evaluating
%f(x) near zero.
Table = table(xl,cl,xr,cr, 'VariableNames',{'x<0','C(x<0)','x>0','C(x>0)'});
fprintf('The value of x near zero for the condition number, are all small meaning the function is well condition and stable,\n since a small input to '

fprintf('3b.\n');
%Evaluate th function f(x) = log(x +1)/x using the expression as given for x
f = @(x) (log(x+1))./x;

j = [0:520]';
xj = 2.^(-52 + j./10);
fj = f(xj);

%plot of f
semilogx(xj,fj);
hold on
title('f & z against x');
xlabel('x'); ylabel('f');
fprintf('The algorithm looks to be unstable near x = 0, according to the distortion of the curve observed \n near that point \n');

fprintf('3c.\n');
%Now evaluate f(x) at the same xj values as part (b)
z = 1 + xj;
y = log(z)./(z-1);
semilogx(xj,y);
legend('f(x)','z');

fprintf('Near x = 0, their is no noise the curve is stable, but in part (b), there is alot of noise in the region \n');

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Table =

10x4 table

x<0	C(x<0)	x>0	C(x>0)
-0.05	0.0260908287486144	1e-07	5.05838629918435e-08
-0.04444444555555556	0.0230796152641136	0.00555564444444444	0.00276502570151982
-0.0388889111111111	0.0200974832032458	0.01111118888888889	0.00550466255089419
-0.03333336666666667	0.0171439805604763	0.01666673333333333	0.00821933465005636
-0.02777782222222222	0.0142186649472498	0.02222227777777778	0.0109094085358283
-0.02222227777777778	0.0113211033332172	0.02777782222222222	0.0135752433734707
-0.01666673333333333	0.00845087179580214	0.03333336666666667	0.0162171911443507
-0.01111118888888889	0.00560755527792527	0.03888891111111111	0.0188355968277381
-0.00555564444444444	0.0027907473534124	0.04444445555555556	0.021430798577109
-1e-07	5.052635999267e-08	0.05	0.0240031278910547

The value of x near zero for the condition number, are all small meaning the function is well condition and stable, since a small input to the condition number yeild a small output, as observed from the table for different values of x near zero

3b.

The algorithm looks to be unstable near x = 0, according to the distortion of the curve observed near that point

3c.

Near x = 0, their is no noise the curve is stable, but in part (b), there is alot of noise in the region

