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%Global error comparision of second-order and fourth order Taylor methods.
%Problem:  y'=y-t^2+1, y(0)=0.5; t in [0,2]
%Exact sourion  yr(t)=(t+1)^2-0.5exp(t)
%Input:  m - number of subintervals
%Output: ys - Second order method solution, es- global error
%        yf - Fourth order  method solution, ef- global error
%       Plotting and producing tables of the errors

function[ys yf es ef]=tayl24(m)
h=2/m; ys(1)=0.5; yf(1)=0.5; t(1)=0;
es(1)=0; ef(1)=0;
%Iteration_____________________________________________________________________
for k=2:m+1;
    t(k)=(k-1)*h;
    ys(k)=ys(k-1)+h*((1+h/2)*(ys(k-1)-t(k-1)^2+1)-h*t(k-1));
    es(k)=abs(ys(k)-yr(t(k)));
    yf(k)=yf(k-1)+h*((1+h/2+h^2/6+h^3/24)*(yf(k-1)-t(k-1)*t(k-1))-...
     (1+h/3+h^2/12)*h*t(k-1)+1+h/2-h^2/6-h^3/24) ;
    ef(k)=abs(yf(k)-yr(t(k)));
end
%Producing the global error table_____________________________________________
disp(' Table of the global errors (m=10)')
disp('  tk             Error(2)         Error(4) ')
disp('-----------------------------------------------------')
for k=1:m+1
  disp(sprintf('%7.3e    %7.8e    %7.8e ',t(k),es(k),ef(k)))
end
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function[f]=yr(t)
f=(t+1)^2-0.5*exp(t);
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[y2 y4 e2 e4]=tayl24(10);

 Table of the global errors (m=10)
  tk             Error(2)         Error(4)
-----------------------------------------------------
0.000e+000    0.00000000e+000    0.00000000e+000
2.000e-001    7.01379080e-004    1.37908009e-006
4.000e-001    1.71234882e-003    3.36882064e-006
6.000e-001    3.13540020e-003    6.17202325e-006
8.000e-001    5.10318425e-003    1.00513570e-005
1.000e+000    7.78683263e-003    1.53459266e-005
1.200e+000    1.14064818e-002    2.24922430e-005
1.400e+000    1.62445684e-002    3.20507328e-005
1.600e+000    2.26626058e-002    4.47392105e-005
1.800e+000    3.11223324e-002    6.14751001e-005
2.000e+000    4.22123418e-002    8.34286356e-005
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