Computing Assignment 1: Solving for N*

w02w_GEerr.m -- GE truncation error

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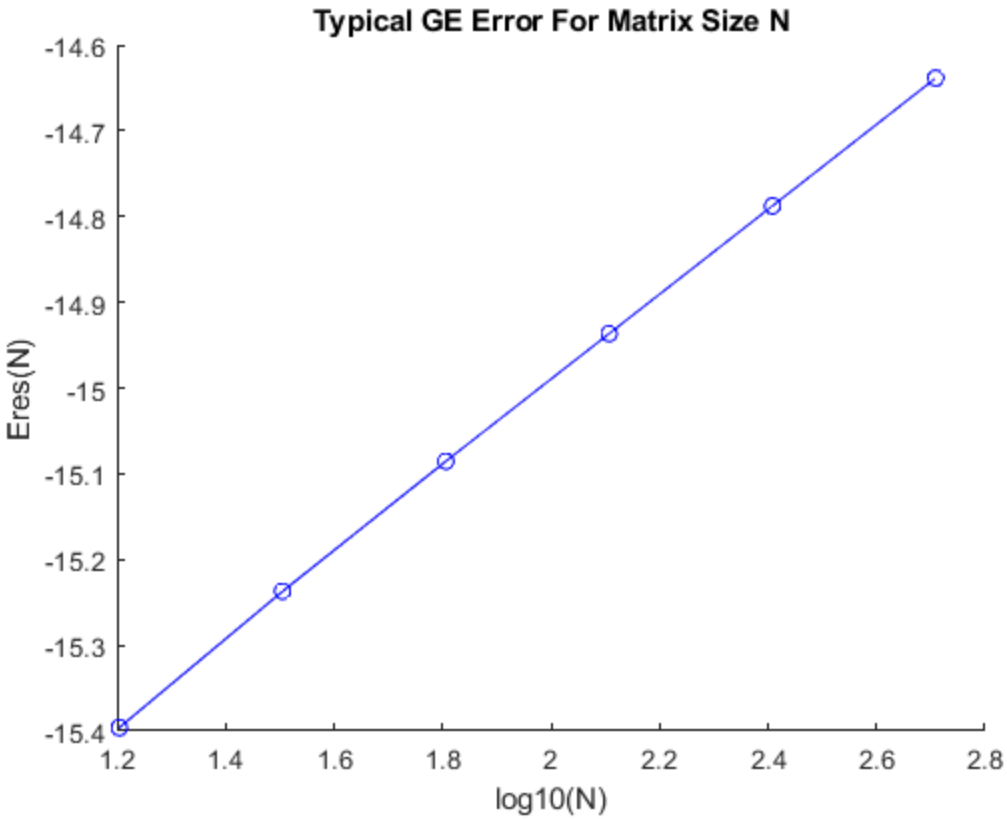
```
clear;

testVect = [16, 32, 64, 128, 256, 512];
e_res_arr = [];
finalTime = 0;
NexVal = 3000;

for itr = 1:length(testVect)
    tic
    disp("Test case for N = "+testVect(itr));

    %  N = matrix size;  Nex = # of experiments
    N = 1*testVect(itr);
    Nex = 1*NexVal;

    %  solution of all ones
    x0 = ones(N,1);

    %  data vector of errors
    res_err = zeros(Nex,1);
    sol_err = zeros(Nex,1);

    e_res = 0;

    for kk = 1:Nex
        %  make random matrix & b-vector
        A = eye(N,N) + randn(N,N)/sqrt(N);
        b = A*x0;

        %  GE via backslash
        x1 = A \ b;

        %  rms residual error
        res_err(kk) = rms(A*x1-b);

        % rms solution error
        sol_err(kk) = rms(x1-x0);

    end

    e_res_arr(itr) = mean(log10(res_err));

    finalTime = finalTime + toc;
    disp(toc + " seconds elapsed");
    disp(" ");
end
```

```
disp("Total Experiment Time: " + finalTime)

% ploted lines

x = log10(testVect);
y = e_res_arr;

figure
hold on;
title('Typical GE Error For Matrix Size N')
ylabel('Eres(N)')
xlabel('log10(N)')
plot(x, y, 'b-o');
hold off;
```

```
Test case for N = 16
0.11574 seconds elapsed

Test case for N = 32
0.24604 seconds elapsed

Test case for N = 64
0.85613 seconds elapsed

Test case for N = 128
2.3547 seconds elapsed

Test case for N = 256
7.6381 seconds elapsed

Test case for N = 512
48.7002 seconds elapsed

Total Experiment Time: 59.9106
```



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