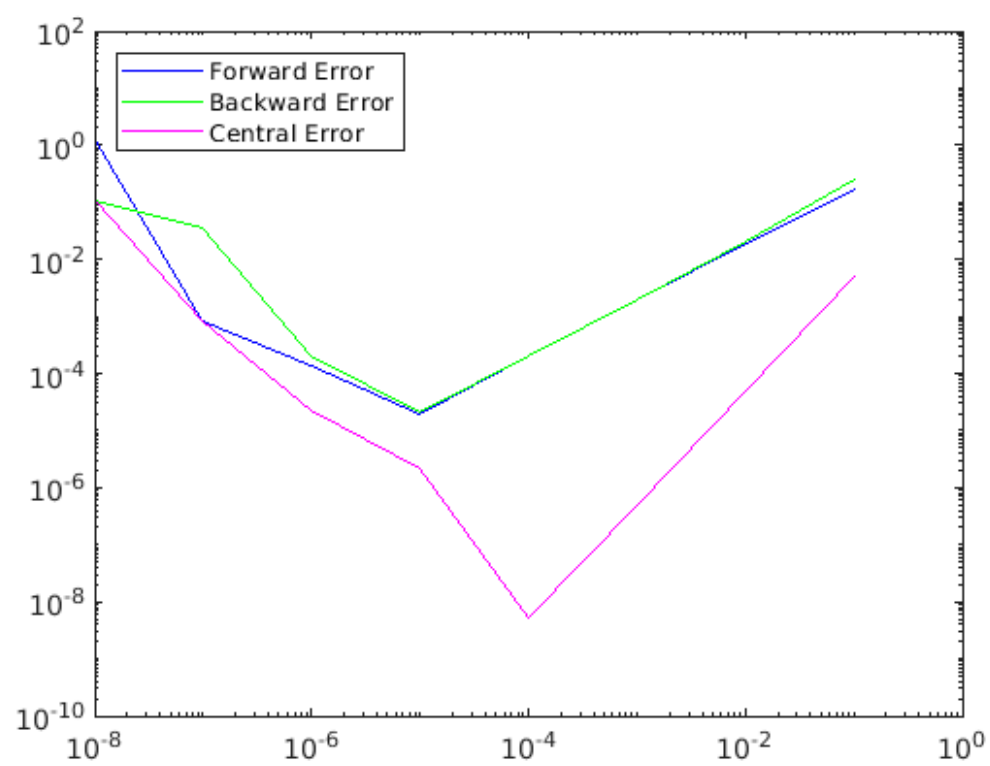

```

% Q2 (iii)

% Matlab script to calculate
% second order numerical differentiation of 2-x+ln(x) at x=1
a = 1;
trueVal = -1;
h = 10.^[-1:-1:-8];
% Forward diff. for second order derivative
fwdDiff = (f(a + 2*h) - 2*f(a + h) + f(a))./(h.*h);
errFwd = abs(trueVal - fwdDiff);
disp(['Error in forward diff. for second order derivative: ',
    num2str(errFwd)]);
% Backward diff. for second order derivative
bckDiff = (f(a) - 2*f(a - h) + f(a - 2*h))./(h.*h);
errBck = abs(trueVal - bckDiff);
disp(['Error in backward diff. for second order derivative: ',
    num2str(errBck)]);
% Central diff. for second order derivative
cntrDiff = (f(a + h) - 2*f(a) + f(a - h))./(h.*h);
errCntr = abs(trueVal - cntrDiff);
disp(['Error in central diff. for second order derivative: ',
    num2str(errCntr)]);
% Plots
loglog(h, errFwd, '-b', h, errBck, '-g', h, errCntr, '-m');
legend('Forward Error', 'Backward Error', 'Central
    Error', 'Location', 'northwest');
% Function
function fx = f(x)
    fx = 2 - x + log(x);
end

Error in forward diff. for second order derivative: 0.17012
    0.019656    0.0019965    0.00019998    1.9901e-05    0.00013314    0.00079928
    1.2204
Error in backward diff. for second order derivative: 0.24225
    0.020356    0.0020035    0.00020003    2.1177e-05    0.00019992    0.034106
    0.11022
Error in central diff. for second order derivative: 0.0050336
    5.0003e-05    5.0018e-07    5.0248e-09    2.1377e-06    2.2122e-05
    0.00079928    0.11022

```



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