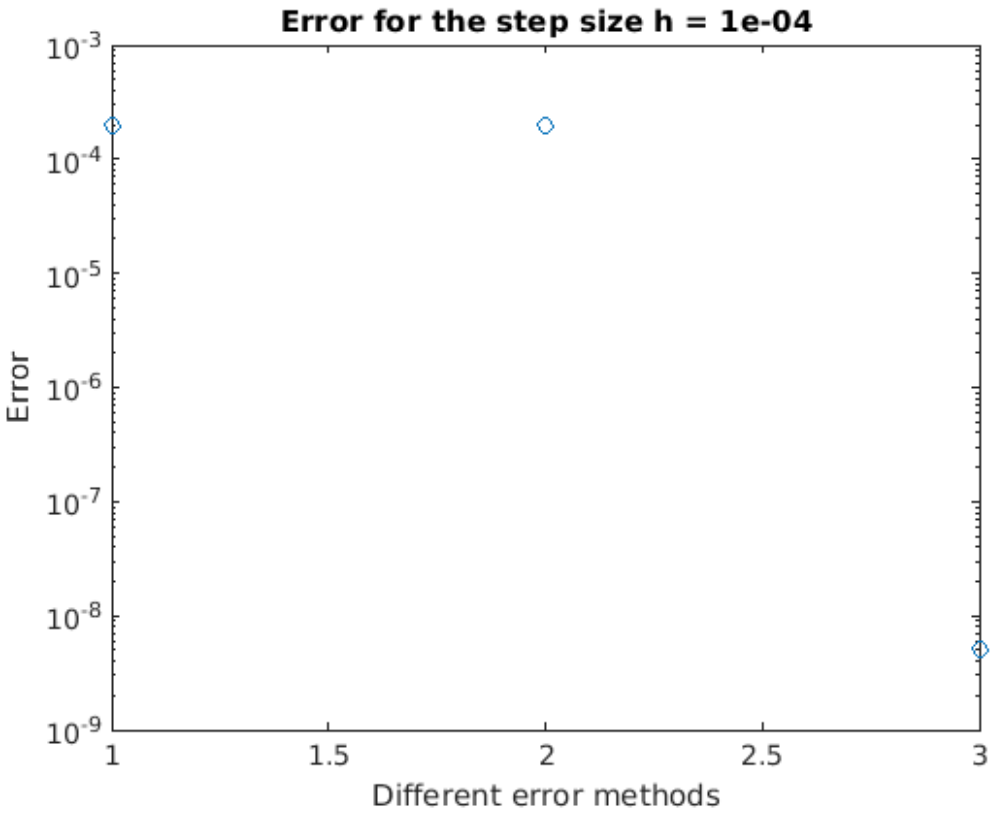
```
% Q2 (iv)

% Matlab script to calculate
% first order numerical differentiation of 2-x+ln(x) at x=1
a = 1;
trueVal = -1;
h = 1e-4;
% 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
semilogy([errFwd, errBck, errCntr], 'o')
title('Error for the step size h = 1e-04')
ylabel('Error')
xlabel('Different error methods')
% Function
function fx = f(x)
  fx = 2 - x + log(x);
end
```

```
Error in forward diff. for second order derivative: 0.00019998
Error in backward diff. for second order derivative: 0.00020003
Error in central diff. for second order derivative: 5.0248e-09
```



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