

ASSIGNMENT 1

- Deerghanshu

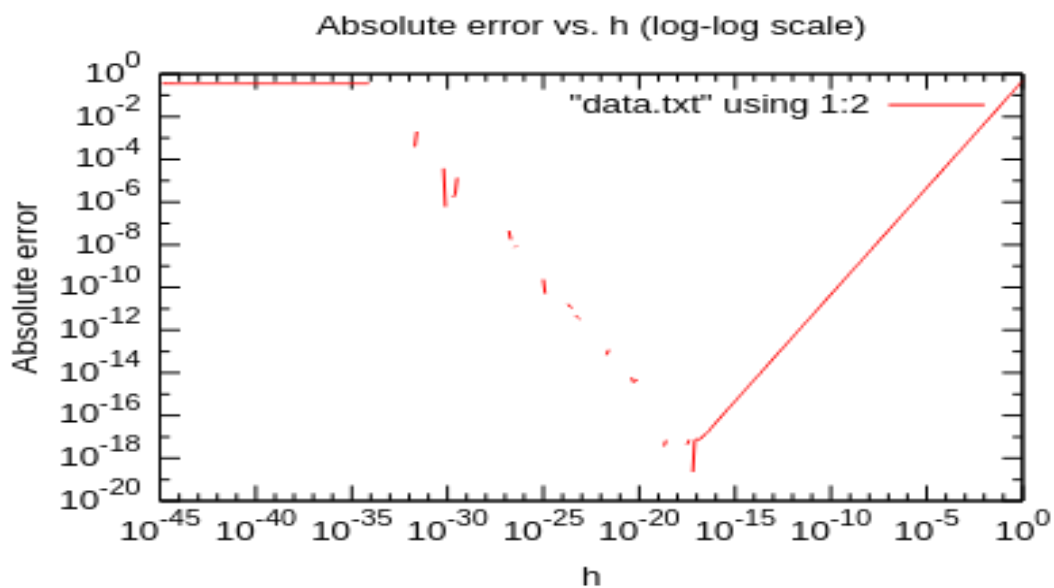
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A1. The table below shows the comparison between absolute and relative error for calculation of factorial of natural number n using the Stirling approximation as n increases.

n	S_n	$n!$	Absolute Error	Relative Error
1	0.922137022	1.000000000	7.78629780E-02	7.78629780E-02
2	1.91900456	2.000000000	8.09954405E-02	4.04977202E-02
3	5.83621120	6.000000000	0.163788795	2.72981320E-02
4	23.5061798	24.00000000	0.493820190	2.05758419E-02
5	118.019211	120.0000000	1.98078918	1.65065769E-02
6	710.078430	720.0000000	9.92156982	1.37799578E-02
7	4980.39795	5040.000000	59.6020508	1.18258037E-02
8	39902.4141	40320.00000	417.585938	1.03567941E-02
9	359536.969	362880.0000	3343.03125	9.21249762E-03
10	3598697.75	3628800.00	30102.2500	8.29537306E-03

As we see that as n increases, the absolute error increases rapidly while, the relative error decreases and can be related easily. Hence, relative error is preferred.

A2.



Here, as the value of h decreases up to a certain value, absolute error decreases linearly but, decreasing it beyond the order of 10^{-20} , increases the error drastically until it reaches the order of 10^0 . This happens when the round-off error dominates the discretization error as h decreases and causes the anomaly.