

A table for forward, backward and central divided difference example

$$f(x) = 2 * \exp(1.5 * x)$$

Initial Step

size 0.1

x 3

Exact

Value $f'(3)$ 270.05139390

Forward Divided Difference

x	h	f'(x)	Approximate Error	Absolute Relative Approximate Error in Percentage	Number of Significant Digits Correct	Absolute Relative True Error in Percentage	True Error
3	0.1000000000	291.3571				7.8895	-21.3057
3	0.0500000000	280.4363	-10.9208	3.8942	1	3.8455	-10.3849
3	0.0250000000	275.1787	-5.2576	1.9106	1	1.8987	-5.1274
3	0.0125000000	272.5990	-2.5797	0.9463	1	0.9434	-2.5476
3	0.0062500000	271.3212	-1.2778	0.4710	2	0.4702	-1.2698
3	0.0031250000	270.6853	-0.6359	0.2349	2	0.2347	-0.6339

Backward Divided Difference

x	h	f'(x)	Approximate Error	Absolute Relative Approximate Error in Percentage	Number of Significant Digits Correct	Absolute Relative True Error in Percentage	True Error
3	0.1000000000	250.7734				7.1387	19.2780
3	0.0500000000	260.1730	9.3996	3.6128	1	3.6580	9.8784
3	0.0250000000	265.0506	4.8777	1.8403	1	1.8518	5.0008
3	0.0125000000	267.5354	2.4848	0.9288	1	0.9317	2.5160
3	0.0062500000	268.7895	1.2541	0.4666	2	0.4673	1.2619
3	0.0031250000	269.4194	0.6300	0.2338	2	0.2340	0.6319

Central Divided Difference

x	h	f'(x)	Approximate Error	Absolute Relative Approximate Error in Percentage	Number of Significant Digits Correct	Absolute Relative True Error in Percentage	True Error
3	0.1000000000	271.0652				0.3754	-1.01383262
3	0.0500000000	270.3046	-0.7606	0.2814	2	0.0938	-0.25324440
3	0.0250000000	270.1147	-0.1899	0.0703	2	0.0234	-0.06329775
3	0.0125000000	270.0672	-0.0475	0.0176	3	0.0059	-0.01582360
3	0.0062500000	270.0553	-0.0119	0.0044	4	0.0015	-0.00395585
3	0.0031250000	270.0524	-0.0030	0.0011	4	0.0004	-0.00098896

Central Divided Difference and the order of accuracy!

x	h	f'(x)	True Error	First Term of Error	Rest of the Error Terms	Error/(deltax^2)
3	0.1000000000	271.0652	-1.01383262	-1.01269273	-0.00113989	-101.2693
3	0.0500000000	270.3046	-0.25324440	-0.25317318	-0.00007121	-101.2978
3	0.0250000000	270.1147	-0.06329775	-0.06329330	-0.00000445	-101.2764
3	0.0125000000	270.0672	-0.01582360	-0.01582332	-0.00000028	-101.2711
3	0.0062500000	270.0553	-0.00395585	-0.00395583	-0.00000002	-101.2697
3	0.0031250000	270.0524	-0.00098896	-0.00098896	0.00000000	-101.2694
						101.2693