

A table for forward, backward and central divided difference example

Corrected Version

$$f(x)=7x^4$$

Initial Step

size 0.16

x 3

Exact Value

$f'(3)$ 756.00000000

Forward Divided Difference

x	h	f'(x)	Absolute Relative		Number of Significant Digits Correct	Absolute Relative	
			Approximate Error	Approximate Error in Percentage		True Error in Percentage	True Error
3	0.1600	818.6591				8.2882	-62.6591
3	0.0800	786.7812	-31.8779	4.0517	1.0000	4.0716	-30.7812
3	0.0400	771.2548	-15.5263	2.0131	1.0000	2.0178	-15.2548
3	0.0200	763.5937	-7.6612	1.0033	1.0000	1.0045	-7.5937
3	0.0100	759.7884	-3.8052	0.5008	1.0000	0.5011	-3.7884
3	0.0050	757.8921	-1.8963	0.2502	2.0000	0.2503	-1.8921

Backward Divided Difference

x	h	f'(x)	Absolute Relative		Number of Significant Digits Correct	Absolute Relative	
			Approximate Error	Approximate Error in Percentage		True Error in Percentage	True Error
3	0.1600	697.6417				7.7193	58.3583
3	0.0800	726.2940	28.6523	3.9450	1.0000	3.9294	29.7060
3	0.0400	741.0140	14.7199	1.9865	1.0000	1.9823	14.9860
3	0.0200	748.4735	7.4596	0.9966	1.0000	0.9956	7.5265
3	0.0100	752.2284	3.7548	0.4992	2.0000	0.4989	3.7716
3	0.0050	754.1121	1.8837	0.2498	2.0000	0.2497	1.8879

Central Divided Difference

x	h	f'(x)	Absolute Relative		Number of Significant Digits Correct	Absolute Relative	
			Approximate Error	Approximate Error in Percentage		True Error in Percentage	True Error
3	0.1600	758.1504				0.2844	-2.1504
3	0.0800	756.5376	-1.6128	0.2132	2.0000	0.0711	-0.5376
3	0.0400	756.1344	-0.4032	0.0533	2.0000	0.0178	-0.1344
3	0.0200	756.0336	-0.1008	0.0133	3.0000	0.0044	-0.0336
3	0.0100	756.0084	-0.0252	0.0033	4.0000	0.0011	-0.0084
3	0.0050	756.0021	-0.0063	0.0008	4.0000	0.0003	-0.0021

Central Divided Difference and the order of accuracy!

x	h	f(x)	First Term of		Rest of the	
			True Error	Error	Error Terms	Error/(h^2)
3	0.1600	758.1504	-2.1504	-2.1504	0.0000	-84.0000
3	0.0800	756.5376	-0.5376	-0.5376	0.0000	-84.0000
3	0.0400	756.1344	-0.1344	-0.1344	0.0000	-84.0000
3	0.0200	756.0336	-0.0336	-0.0336	0.0000	-84.0000
3	0.0100	756.0084	-0.0084	-0.0084	0.0000	-84.0000
3	0.0050	756.0021	-0.0021	-0.0021	0.0000	-84.0000
						-84.0000 Exact

Second Derivative

Exact

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x	h	f'(x)	Approximate Error	Absolute Relative Approximate Error in Percentage	Number of Significant Digits Correct	Absolute Relative True Error in Percentage
2	0.6400	341.7344				54.7970
2	0.3200	337.4336	-4.3008	1.2746	1.0000	55.3659
2	0.1600	336.3584	-1.0752	0.3197	2.0000	55.5081
2	0.0800	336.0896	-0.2688	0.0800	2.0000	55.5437
2	0.0400	336.0224	-0.0672	0.0200	3.0000	55.5526
2	0.0200	336.0056	-0.0168	0.0050	4.0000	55.5548

**True
Error**

414.2656
418.5664
419.6416
419.9104
419.9776
419.9944