

MCS 440 – Prof. Richard B. Goldstein

Richardson's Estimate for $f'(1.2)$ for $f(x) = \tan(x)$

Actual: $\sec^2(1.2) = 7.615\ 963\ 967\ 207\ 05$

h	$N_1(h)$	$N_2(h)$	$N_3(h)$	$N_4(h)$
0.1	8.186 713 953 596 64			
0.05	7.750 727 251 075 06	7.605 398 350 234 53		
0.025	7.649 193 449 301 39	7.615 348 848 710 16	7.616 012 215 275 20	
0.0125	7.624 242 996 126 10	7.615 926 178 401 00	7.615 964 667 047 06	7.615 963 912 313 28
errors	0.570 749 986 389 59			
	0.134 763 283 868 01	-0.010 565 616 972 52		
	0.033 229 482 094 33	-0.000 615 118 496 89	0.000 048 248 068 15	
	0.008 279 028 919 04	-0.000 037 788 806 05	0.000 000 699 840 00	-0.000 000 054 893 78

h	$N_1(h)$	$N_2(h)$	$N_3(h)$	$N_4(h)$
0.1	$=(\text{TAN}(1.2+A2)-\text{TAN}(1.2-A2))/(2*A2)$			
0.05	$=(\text{TAN}(1.2+A3)-\text{TAN}(1.2-A3))/(2*A3)$	$=B3+(B3-B2)/3$		
0.025	$=(\text{TAN}(1.2+A4)-\text{TAN}(1.2-A4))/(2*A4)$	$=B4+(B4-B3)/3$	$=C4+(C4-C3)/15$	
0.0125	$=(\text{TAN}(1.2+A5)-\text{TAN}(1.2-A5))/(2*A5)$	$=B5+(B5-B4)/3$	$=C5+(C5-C4)/15$	$=D5+(D5-D4)/63$
errors	$=B2-1/(\text{COS}(1.2)^2)$			
	$=B3-1/(\text{COS}(1.2)^2)$	$=C3-1/(\text{COS}(1.2)^2)$		
	$=B4-1/(\text{COS}(1.2)^2)$	$=C4-1/(\text{COS}(1.2)^2)$	$=D4-1/(\text{COS}(1.2)^2)$	
	$=B5-1/(\text{COS}(1.2)^2)$	$=C5-1/(\text{COS}(1.2)^2)$	$=D5-1/(\text{COS}(1.2)^2)$	$=E5-1/(\text{COS}(1.2)^2)$

One more row would give: 7.615 963 967 222 83 with an error of 0.000 000 000 015 78