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Lab 3

Data Analysis

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In this lab the goal was to understand the idea that a loss of significance occurs in computer arithmetic because of the way values are stored, and because of some of the operations used to calculate the values. We examined two separate functions: $f(x)$ and $g(x)$. Each was rewritten in order to minimize the loss of significant figures during calculations. Every function was then used to compute 10 different magnitudes of the value of x . We can see that generally using double precision and using the methods to avoid loss has the desired effect.

	Floating point	
x	f(x)	f2(x)
1	0.414213538169861	0.414213538169861
10	1.543471813201900	1.543471217155450
100	4.987525939941400	4.987562179565420
1000	15.808105468750000	15.807437896728500
10000	49.972534179687500	49.998748779296800
100000	158.6914062500000000	158.113494873046000
1000000	488.2812500000000000	499.999877929687000
10000000	2441.4062500000000000	1581.138793945310000
100000000	0.0000000000000000	5000.0000000000000000
1000000000	0.0000000000000000	15811.387695312500000

	Double point	
x	f(x)	f2(x)
1	0.414213567972183	0.414213567972183
10	1.543471336364740	1.543471336364740
100	4.987562179565420	4.987562179565420
1000	15.807437896728500	15.807437896728500
10000	49.998748779296800	49.998748779296800
100000	158.113494873046000	158.113494873046000
1000000	499.999877929687000	499.999877929687000
10000000	1581.138793945310000	1581.138793945310000
100000000	5000.0000000000000000	5000.0000000000000000
1000000000	15811.3906250000000000	15811.388671875000000

	Floating point	
x	g(x)	g2(x)
1	0.459697723388672	0.459697723388672
10	1.008390665054320	0.018390716984868
100	0.999913752079010	0.000013768112694
1000	0.999999463558197	0.000000437620912
10000	1.000000000000000	0.000000019521552
100000	1.000000000000000	0.000000000199936
1000000	1.000000000000000	0.000000000000063
10000000	1.000000000000000	0.000000000000019
100000000	1.000000000000000	0.000000000000000
1000000000	1.000000000000000	0.000000000000000

	Double point	
x	g(x)	g2(x)
1	0.459697693586349	0.459697693586349
10	1.008390665054320	0.018390715122223
100	0.999913752079010	0.000013768112694
1000	0.999999463558197	0.000000437620912
10000	1.000000000000000	0.000000019521554
100000	1.000000000000000	0.000000000199936
1000000	1.000000000000000	0.000000000000063
10000000	1.000000000000000	0.000000000000019
100000000	1.000000000000000	0.000000000000000
1000000000	1.000000000000000	0.000000000000000

List of items learned:

- Loss of significance meaning
- Methods to avoid LOS
- C++ practice