Development Environment

- *Operating System*: Ubuntu 16.04 64 bit
- *Language*: C++, GCC 5.4.0

Problem 1

h	Error in f'(x=1) by Eq.(1) where $f(x) = x^2$	Error in f'(x=1) by Eq.(1) where $f(x) = x^2 + 10^8$	Error in f'(x=1) by Eq.(2) where $f(x) = x^2$	Error in f'(x=1) by Eq.(2) where $f(x) = x^2 + 10^8$
0.1	0.05	0.05	2.22045e-16	2.23517e-08
0.01	0.005	0.00499988	8.88178e-16	2.08616e-07
0.001	0.0005	0.000501215	8.23785e-14	2.02656e-06
0.0001	5e-05	1.69277e-05	3.8769e-13	2.03252e-05
1e-05	5.00001e-06	0.000132084	1.00009e-12	0.000132084
1e-06	4.99962e-07	0.0016222	1.00009e-12	0.0016222
1e-07	5.05439e-08	0.0314245	2.87557e-11	0.0314245
1e-08	6.07747e-09	0.254942	3.30191e-09	0.254942
1e-09	8.27404e-08	1	2.72292e-08	1
1e-10	8.27404e-08	1	8.27404e-08	1
1e-11	8.27404e-08	1	8.27404e-08	1
1e-12	8.89006e-05	1	3.33894e-05	1
1e-13	0.000799278	1	0.000244166	1
1e-14	0.000799278	1	0.000799278	1
1e-15	0.110223	1	0.0547119	1
1e-16	1	1	0.444888	1
1e-17	1	1	1	1
1e-18	1	1	1	1

Problem 2

h	Error in f'(x=1) by Eq.(3)	Error in f'(x=1) by Eq.(4)	Error in f'(x=1) by Eq.(5)	eta by Eq. (6)	eta by Eq.(7)
0.0001	0.000100003	0.000200013	6.6672e-09	2.00007	2.0002
1e-05	1e-05	2.00001e-05	6.79089e-11	2.00001	2.00002
1e-06	9.99933e-07	2.00002e-06	1.5522e-10	2.00016	1.99978
1e-07	1.00504e-07	1.99314e-07	2.48353e-09	1.98314	2.03184
1e-08	1.32402e-09	2.72292e-08	2.98023e-08	20.5656	0.428571
1e-09	8.27404e-08	2.82819e-08	1.58946e-07	0.341815	-0.5
1e-10	8.27404e-08	8.27404e-08	0	1	-nan
1e-11	8.27404e-08	8.27404e-08	0	1	-nan
1e-12	8.89006e-05	2.21217e-05	0.00016276	0.248837	-0
1e-13	0.000799278	0.000310945	0.00130208	0.389033	-0.5
1e-14	0.000799278	0.000799278	0	1	-nan
1e-15	0.110223	0.000799278	0.166667	0.00725146	-0
1e-16	1	0.110223	2.33333	0.110223	0
1e-17	1	1	1	1	-nan
1e-18	1	1	86.3333	1	-nan

1e-19	1	1	1	1	-nan
1e-20	1	1	1	1	-nan
1e-21	1	1	1	1	-nan
1e-22	1	1	1	1	-nan
1e-23	1	1	1	1	-nan
1e-24	1	1	1	1	-nan
1e-25	1	1	1	1	-nan
1e-26	1	1	1	1	-nan
1e-27	1	1	1	1	-nan
1e-28	1	1	1	1	-nan
1e-29	1	1	1	1	-nan
1e-30	1	1	1	1	-nan
1e-31	1	1	1	1	-nan
1e-32	1	1	1	1	-nan
1e-33	1	1	1	1	-nan
1e-34	1	1	1	1	-nan
1e-35	1	1	1	1	-nan
1e-36	1	1	1	1	-nan
1e-37	1	1	1	1	-nan
1e-38	1	1	1	1	-nan
1e-39	1	1	1	1	-nan
1e-40	1	1	1	1	-nan