Lab 04

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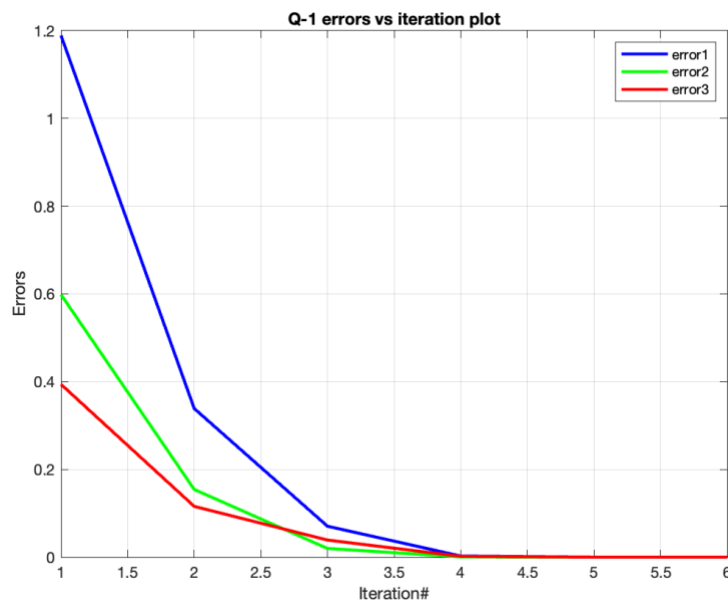
Q-1: Six iterations of Newton's method for finding a root of the non-linear system starting with (1, 1, 1).

$$x_1 x_2 = x_3^2 + 1,$$

$$x_1 x_2 x_3 + x_2^2 = x_1^2 + 2,$$

$$e^{x_1} + x_3 = e^{x_2} + 3.$$

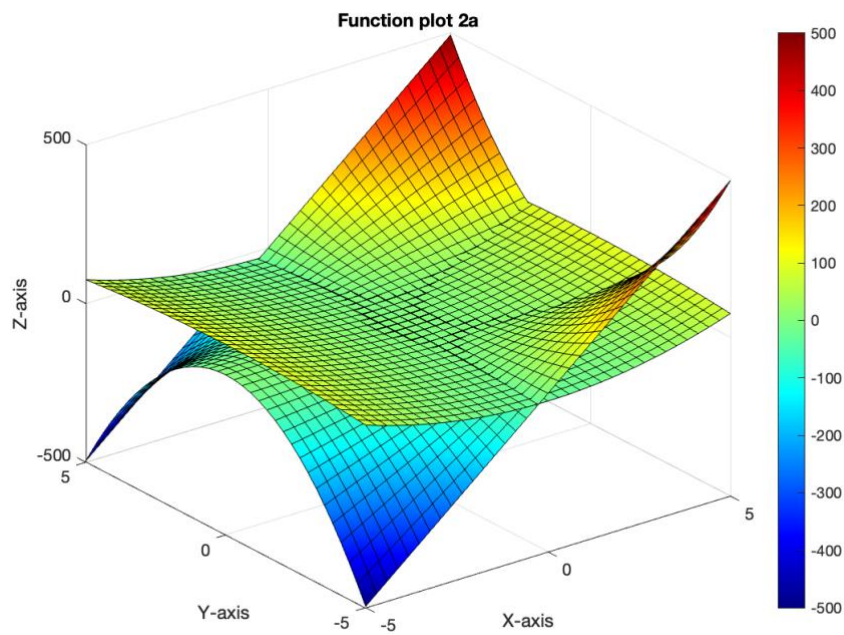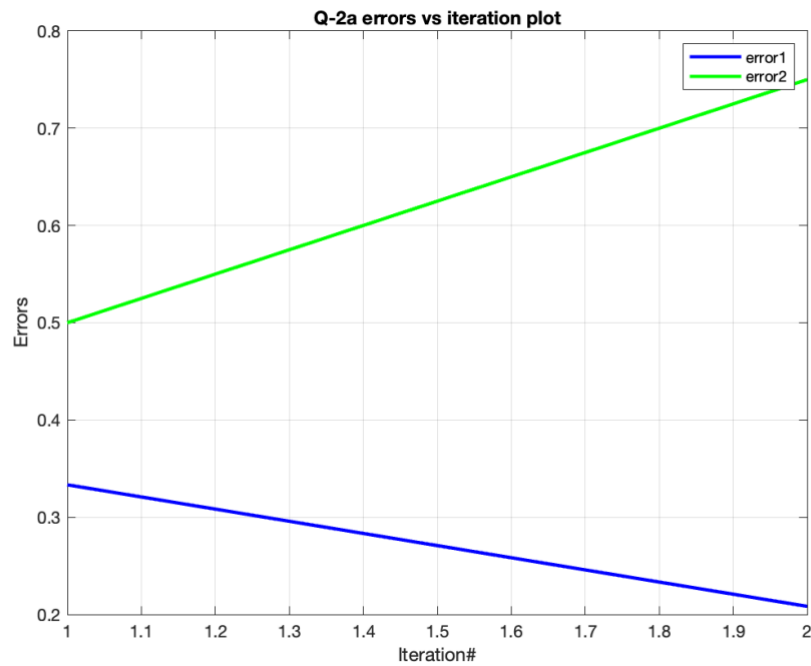| Iteration#	x1	x2	x3	error 1	error 2	error 3
1	2.1893261	1.59847516	1.39390063	1.1893261	0.59847516	0.39390063
2	1.85058965	1.44425142	1.278224	-0.3387365	-0.1542237	-0.1156766
3	1.7801612	1.42443598	1.23929244	-0.0704284	-0.0198154	-0.0389316
4	1.77767471	1.42396093	1.23747382	-0.0024865	-0.0004751	-0.0018186
5	1.77767192	1.4239606	1.23747112	-2.79E-06	-3.28E-07	-2.70E-06
6	1.77767192	1.4239606	1.23747112	-3.14E-12	-4.22E-14	-4.41E-12

Q-2 a: Two iterations of Newton's method for finding a root of the non-linear system starting with (0, 1).

$$4x_1^2 - x_2^2 = 0,$$

$$4x_1x_2^2 - x_1 = 1.$$

Iteration#	x1	x2	error 1	error 2
1	0.33333333	0.5	0.33333333	-0.5
2	0.54166667	1.25	0.20833333	0.75

Q-2a errors vs iteration plot
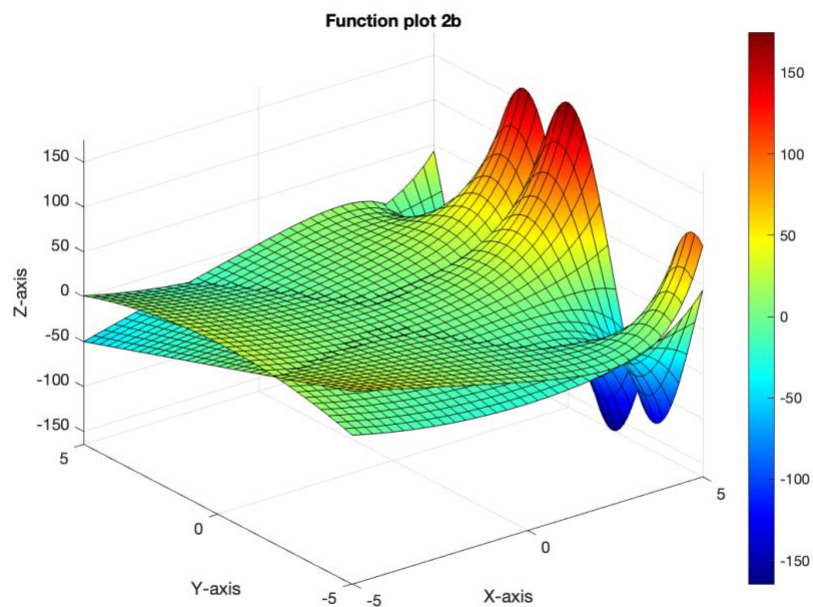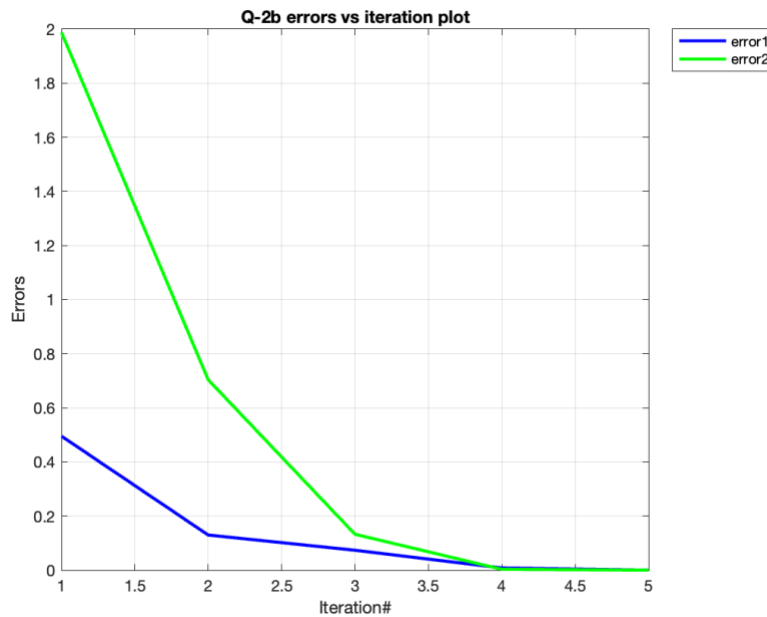

Function plot 2a

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Q-2 b: Five iterations of Newton's method for finding a root of the non-linear system starting with (-1, 4).

$$1 + x^2 - y^2 + e^x \cos(y) \quad = 0,$$

$$2xy + e^x \sin(y) \quad\quad\quad = 0.$$

Iteration#	x1	x2	error 1	error 2
1	-0.5047031	2.01204674	0.49529686	-1.9879533
2	-0.3748672	1.30833023	0.12983594	-0.7037165
3	-0.3013071	1.1757639	7.36E-02	-1.33E-01
4	-0.293178	1.17263436	8.13E-03	-3.13E-03
5	-0.2931627	1.17265982	1.53E-05	2.55E-05

Q-2b errors vs iteration plot

Function plot 2b

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Q-3: Newton's method for finding a root of the non-linear system starting with (0, 0, 0).

$$6x_1 - 2\cos(x_2 x_3) - 1 = 0,$$

$$9x_2 + \sqrt{x_1^2 + \sin(x_3) + 1.06} + 0.9 = 0,$$

$$60x_3 + 3e^{-x_1 x_2} + 10\pi - 3 = 0.$$

Iteration#	x1	x2	x3	error 1	error 2	error 3
1	0.5	-0.1861423	-0.5235988	0.5	-0.1861423	-0.5235988
2	0.49815781	-0.1996068	-0.5288264	-0.0018422	-0.0134645	-0.0052276
3	0.49814468	-0.1996059	-0.528826	-1.31E-05	9.29E-07	4.18E-07
4	0.49814468	-0.1996059	-0.528826	-2.15E-13	-7.49E-12	-1.14E-12

Q-3 errors vs iteration plot

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