Numerical optimization with Python – programming assignment 1

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Quadratic function 1 - Circle contour lines:

point of convergence - newton: [0. 0.], value: 0.0, success: True

point of convergence - GD: [0. 0.], value: 0.0, success: True

Chart

Description automatically generated

Chart, line chart

Description automatically generated

Quadratic function 2 – Elliptical contour lines:

point of convergence - newton: [0. 0.], value: 0.0, success: True

point of convergence - GD: [0.11271997 0.0008856 ], value: 0.012784220095399295, success: False

Chart, line chart

Description automatically generated

Graphical user interface

Description automatically generated

Quadratic function 3 – Rotated elliptical contours:

point of convergence - newton: [-6.66133815e-16 -8.88178420e-16], value: 2.9785327031956913e-30, success: True

point of convergence - GD: [0.07682763 0.13062022], value: 0.02311258419270041, success: False

Chart, line chart

Description automatically generatedChart

Description automatically generated

Rosenbrock function:

point of convergence - newton: [0.99999999 0.99999998], value: 2.7300933598972337e-16, success: True

point of convergence - GD: [0.99970701 0.99941465], value: 8.587653457911118e-08, success: True

Diagram

Description automatically generatedChart

Description automatically generated with low confidence

Linear function:

point of convergence - GD: [-199 -899], value: -8489, success: False

This function cannot converge since its strictly monotonic,

Moreover, Newton’s method is invalid here since the Hessian is 0.

Chart, line chart

Description automatically generatedChart, line chart

Description automatically generated

Smoothed corner triangles function:

point of convergence - newton: [-3.46573016e-01 -3.46939879e-18], value: 2.5592666966586375, success: True

point of convergence - GD: [-3.46571692e-01 -2.84037017e-06], value: 2.559266696709286, success: True

Chart, line chart

Description automatically generatedChart

Description automatically generated