Student name: Adi Dereviani Prager
Student ID: 305674731

Report - Numerical Optimization with Python (2024B)
Programming Assignment 01

Git: https://github.com/adidereviani/numerical_optimization_with_python_ex1

Function Q1 Results:

Gradient descent: Function Q1
Iteration number 100:
Final function location is [0.13261956 0.13261956]
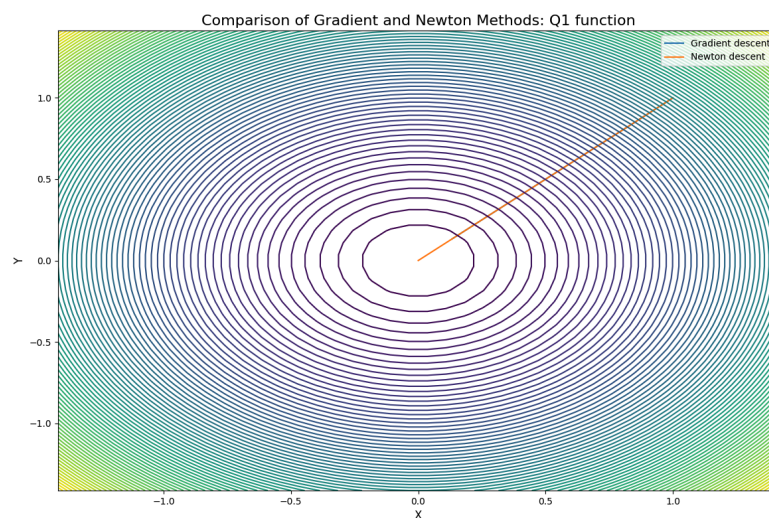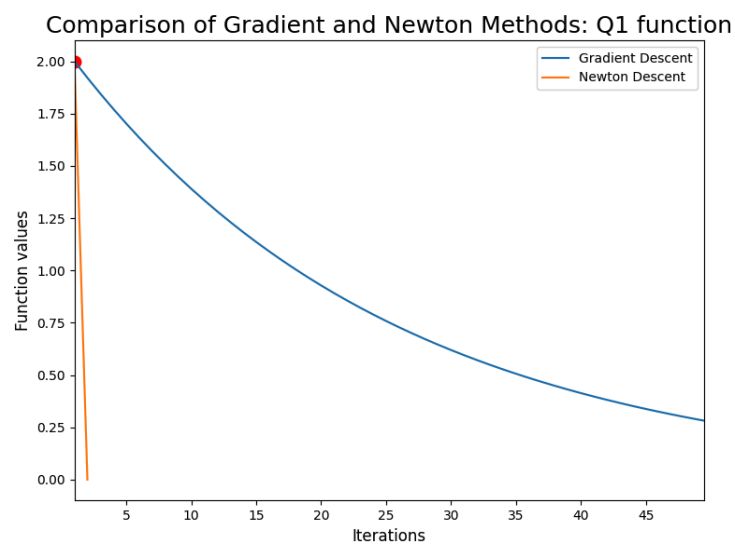Final function value is 0.03517589321144311
Status is: False

Newton descent: Function Q1
Iteration number 1:
Final function location is [0. 0.]
Final function value is 0.0
Status is True

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Function Q2 Results:

Gradient descent: Function Q2
Iteration number 100:
Final function location is [0.05392748 0.00167043]
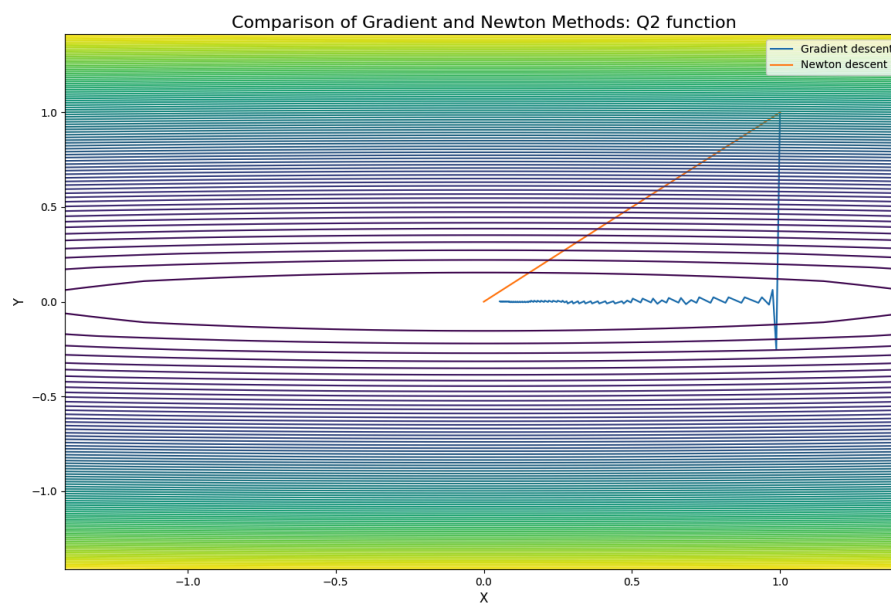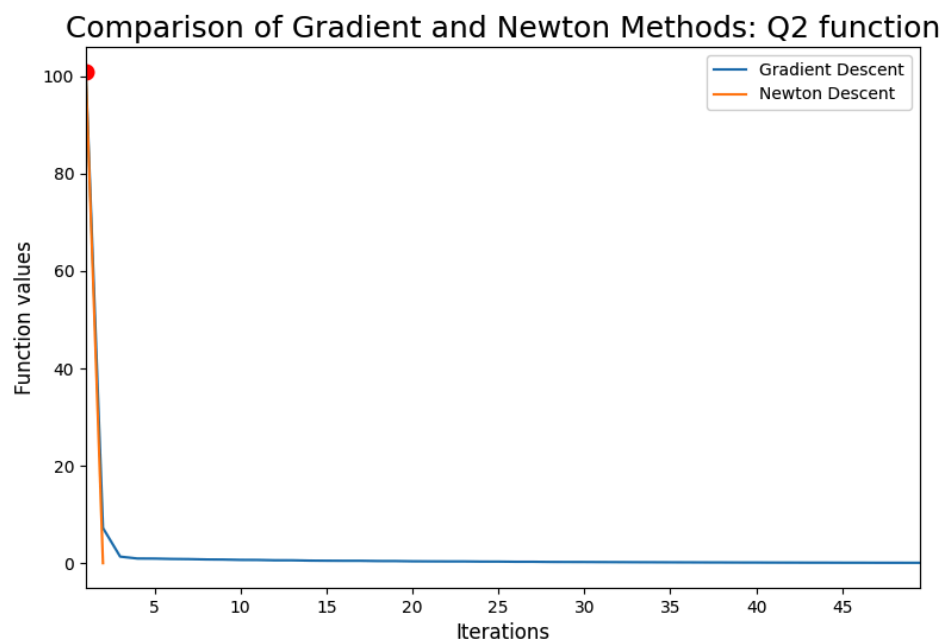Final function value is 0.00318720777644508
Status is: False

Newton descent: Function Q2
Iteration number 1:
Final function location is [0. 0.]
Final function value is 0.0
Status is: True

Comparison of Gradient and Newton Methods: Q2 function

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Function Q3 Results:

Gradient descent: Function Q3
Iteration number 100:
Final function location is [0.09150514 0.15849154]
Final function value is 0.03349275928661371
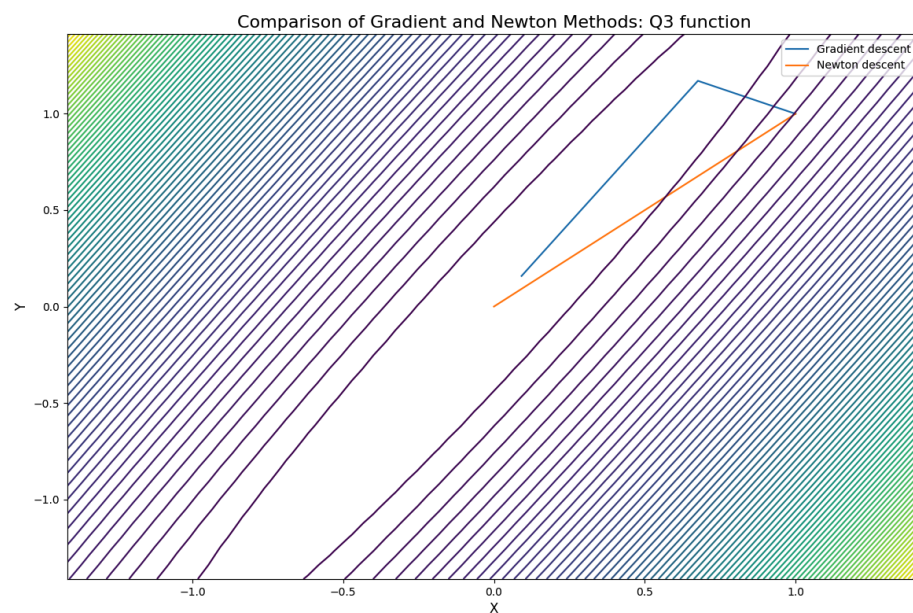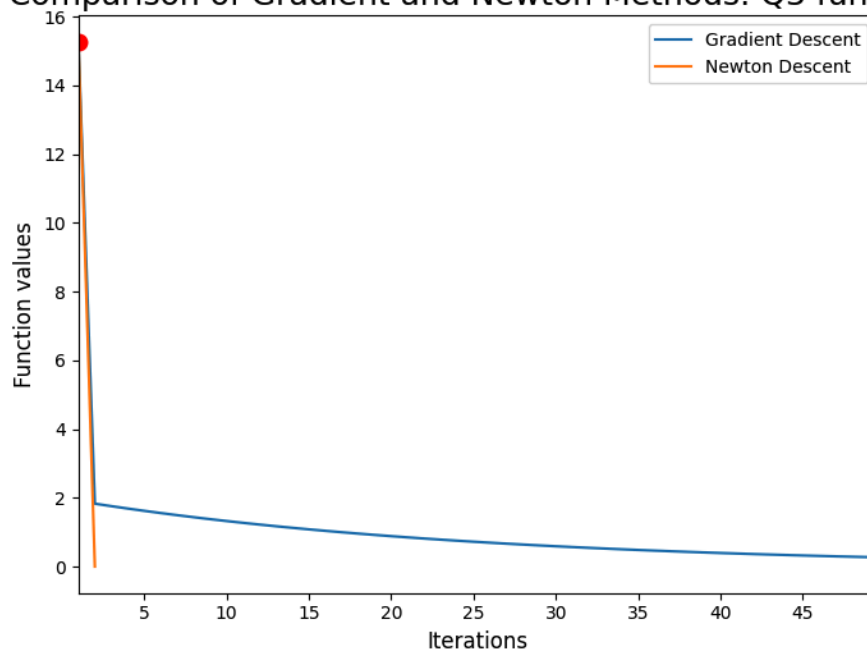Status is: False

Newton descent: Function Q3
Iteration number 1:
Final function location is [-6.66133815e-16 -8.88178420e-16]
Final function value is 2.9785327031956913e-30
Status is: True

Comparison of Gradient and Newton Methods: Q3 function

Comparison of Gradient and Newton Methods: Q3 function

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Function Rosenbrock Results:

Gradient descent: Rosenbrock Function
Iteration number 6486:
Final function location is [0.99989657 0.99979256]
Final function value is 1.0732157748850121e-08
Status is: True
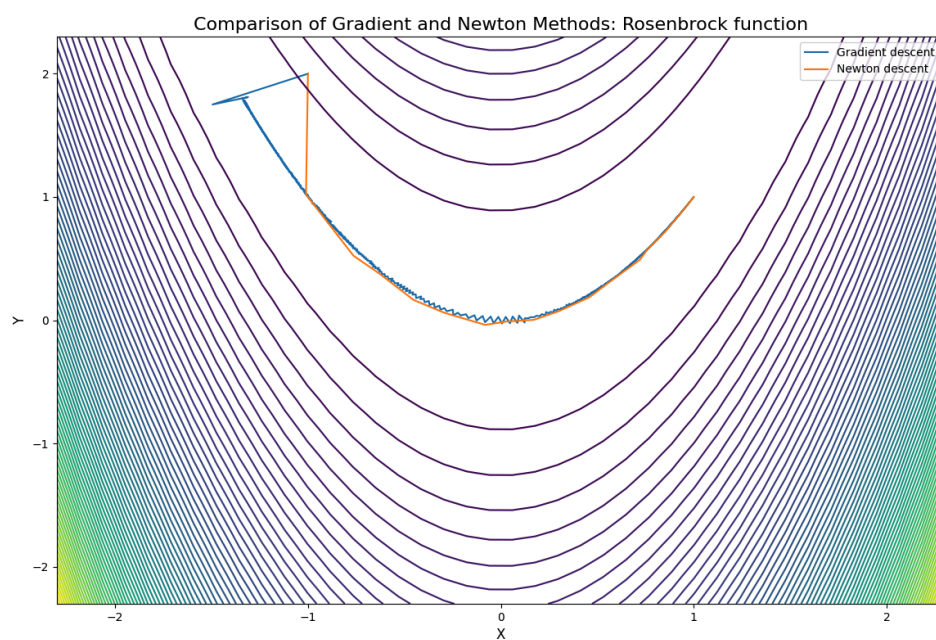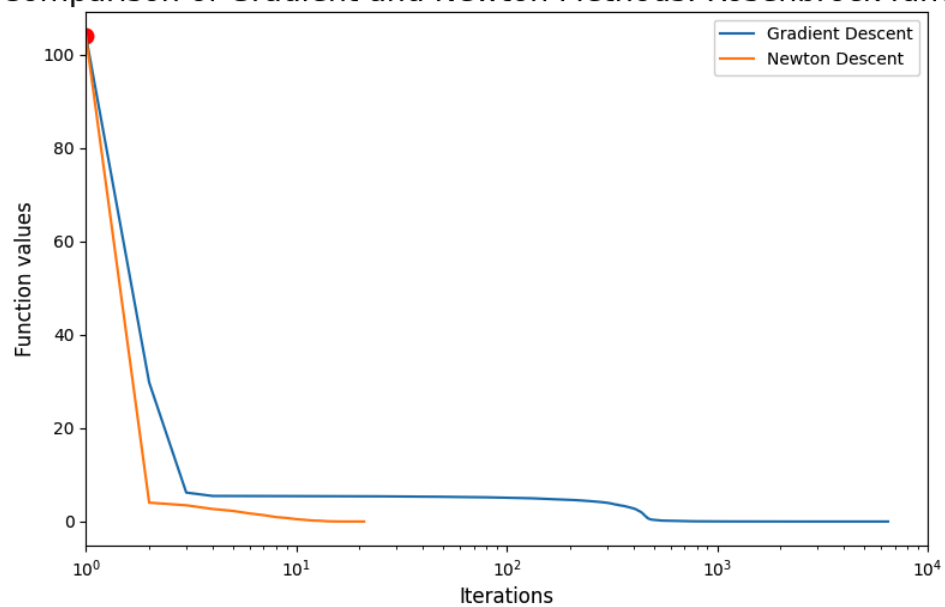
Newton descent: Rosenbrock Function
Iteration number 20:
Final function location is [0.99999999 0.99999998]
Final function value is 2.7300933598972337e-16
Status is: True

Comparison of Gradient and Newton Methods: Rosenbrock function

Comparison of Gradient and Newton Methods: Rosenbrock function

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Function Linear Results:

Gradient descent: Linear Function
Iteration number 100:
Final function location is [-14. -14.]
Final function value is -28.000000000000043
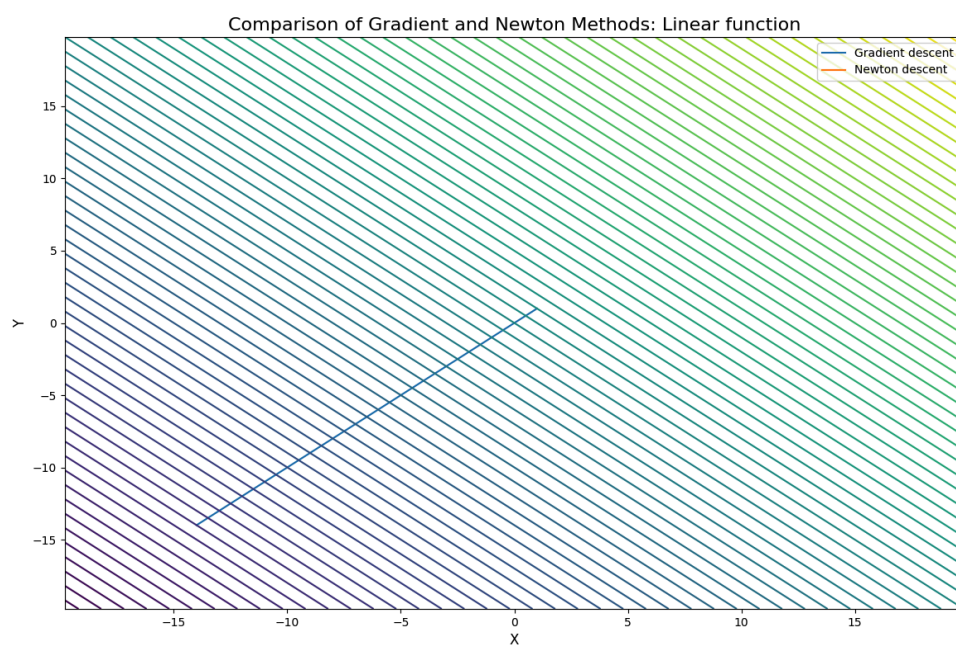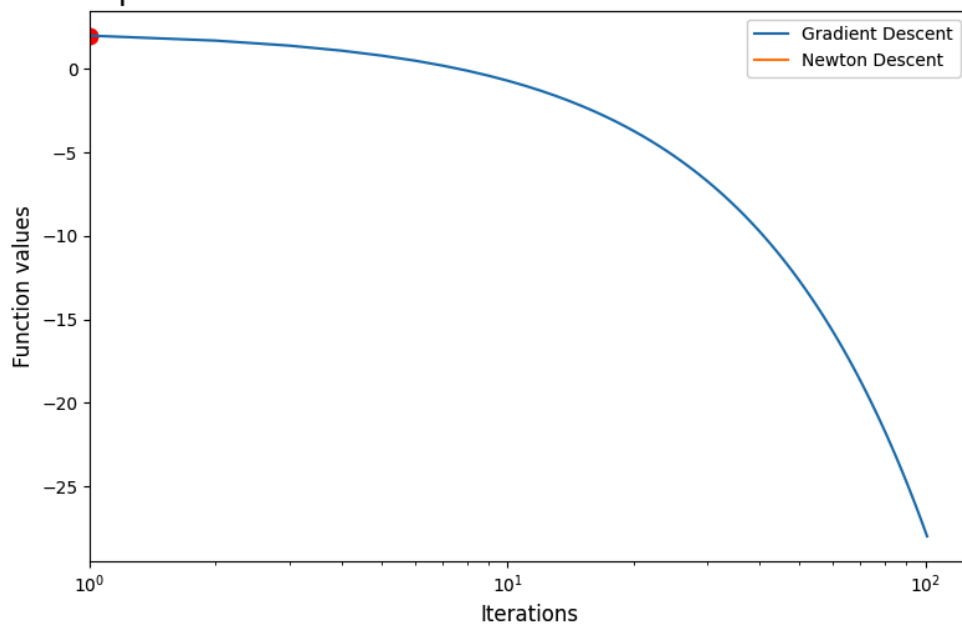Status is: False

Newton descent: Linear Function
Iteration number 0:
Final function location is [1. 1.]
Final function value is 2.0
Status is: False

Comparison of Gradient and Newton Methods: Linear function

Comparison of Gradient and Newton Methods: Linear function

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Function Exponential Results:

Gradient descent: Exponential Function
Iteration number 100:
Final function location is [-2.89049346e-01 -1.80666112e-08]
Final function value is 2.563502220727952
Status is: False

Newton descent: Exponential Function
Iteration number 8:
Final function location is [-3.46573590e-01 6.80689653e-12]
Final function value is 2.5592666966582156
Status is: True

Comparison of Gradient and Newton Methods: Exponential function

Comparison of Gradient and Newton Methods: Exponential function