



שיטות נומריות למהנדסים (019003)

HW 5 Optimization

1. Three 2D function are given:

1. Rosenbrock's banana function (*Rosenbrock.m*).
2. Easom function (*Easom.m*)
3. Eggholder function (*Eggholder.m*) for $0 \leq x, y \leq 500$

For each function find the minimum using the following methods: Quasi-Newton, Steepest Descent, Downhill Simplex, Simulated Annealing (SA), Genetic Algorithm (GA).

You may write your own implementation, use and modify the functions from the recitation, or use Matlab's built-in solvers. Set arbitrary initial conditions as needed. Set the maximal number of iterations to 10^4 . Set the convergence criteria to $||x_{i+1} - x_i|| \leq 10^{-4}$.

Solve each problem 5 times using each method, with different initial conditions. Compare the methods with regards to:

- 1.1.1. Number of iterations.
- 1.1.2. Number of function evaluations performed (might be challenging if using Matlab's built-in solvers).
- 1.1.3. Step size on the last iteration.
- 1.1.4. Change in function value on the last iteration.
- 1.1.5. Minimum position (x,y) and value.

For each problem summarize the results in the following table,

Method Problem	GA	SA	Downhill Simplex	Steepest Descent	Quasi- Newton
<u>1</u>					
<u>2</u>					
<u>3</u>					

For each method, specify the parameters you set, i.e. population size, etc. If a method cannot solve a problem, leave the cell empty and explain the reason.

Discuss the results and consider which method(s) you will use for which problem.