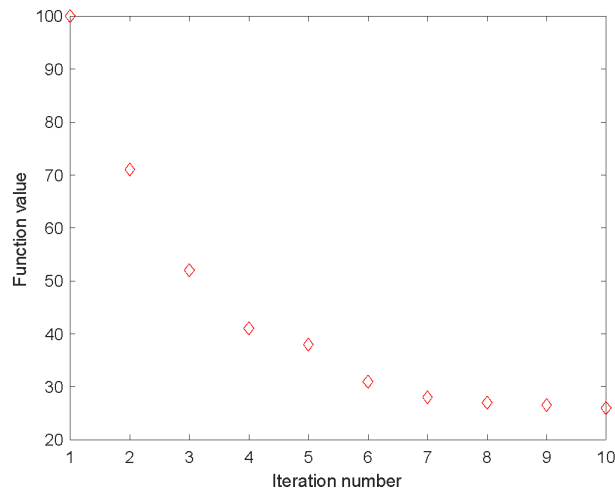


Optimum Design  
Homework #2 (Due Apr 12<sup>th</sup>, 2022)

- Find local maximum and minimum points of the function  $f(x) = x^3 \exp(-x^2)$  within the interval  $[-2, 2]$ . First use the golden section method. (You can directly use the Matlab file `goldSearch.m` from the Hint folder or write your own code.) Then choose one of the other one-dimensional numerical methods taught in class or from the book by S.S. Rao. If you choose the quadratic interpolation method, stop when  $|(f(x^*) - q(x^*)) / f(x^*)| < 10^{-7}$ . For other methods use the termination interval length  $= 10^{-5}$ . Plot function value versus number of function evaluation in each method. For example, the figure may look like this



(Hint: You may need to divide the interval several sections to find local minimum/maximum points.)

- The Himmelblau's function  $f(x_1, x_2) = (x_1^2 + x_2 - 11)^2 + (x_1 + x_2^2 - 7)^2$

Choose one method (the cyclic coordinate method or Hooke and Jeeves' method) combining with any 1-dimensional line search method to find 2 local minimum points (position coordinates and function value) within the interval  $-5 < x_1 < 5$  and  $-5 < x_2 < 5$ . Use a suitable termination criterion of your choice. You can modify the file `tryND1D.m` and other related files in the folder `hw2hint` to perform the optimization. Plot the searching path of finding the global minimum. For example, the searching path of the cyclic coordinate method may look like this:

