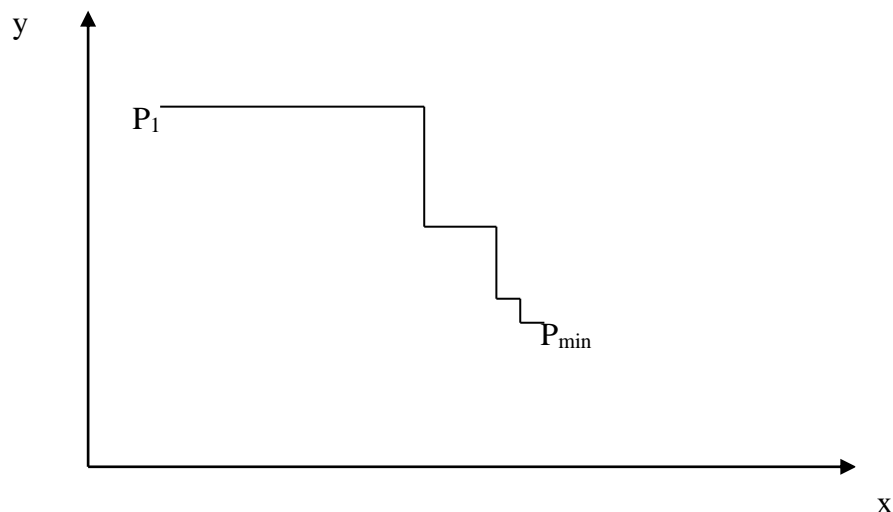


Optimum Design
Homework #2 (Due Apr 16th, 2019)

1. Find local maximum and minimum points of the function $f(x) = x^2 \cos(x)$ within the interval $[2, 12]$. 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 anyone 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. (Hint: You may need to divide the interval several sections to find local minimum/maximum points.)
2. Find two local minimum points (position coordinates and corresponding function values) of Himmelblau's function. Please google this function name to find out its definition. Choose the univariate method or Hooke and Jeeves' method combined with any 1-dimensional line search method to search within the interval $-5 < x < 5$ and $-5 < y < 5$. Use a suitable termination criterion of your own 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 Univariate Method may look like this:



3. Do the same thing in problem 2 with Powell's conjugate direction method or Nelder and Mead's downhill simplex method (for the searching path, plot the center of the simplex in each iteration).