

## Econ 880: Problem Set 4

Due: 12:30 pm, 2.28.2022

Reference: Chapter 4 and notes

### 1. Do Exercise 4.1

Limit attention to the following three methods.

**1.b Steepest descent** with line search. You can use `fminsearch` to find  $\lambda$ .

**1.d Conjugate gradient** based on steepest descent. You can use `fminsearch` to find  $\lambda$ .

To see which method does well, try different starting values, and try to find cases that lead to correct solution under some method(s) but not other(s). Specifically, try starting from (0,0), (-1,-1) and (-1,2), and report  $(x^k, y^k)$  for the first 5 iterations.

You do not need to plot the function, but if you want to have a look at it, the command are `contour()` for contour plot, and `mesh()` for 3D plot.

### 1. Do Exercise 4.2

Solve the problem for  $m = n = 3$  using: (A) Penalty method, (B) Matlab's `fmincon`.

The preference parameters are:

$$\begin{aligned}a_i^i &= 1 \\a_{i+1}^i &= 0.2; a_1^N = 0.2 \\a_j^i &= 0 \text{ in all other cases} \\v_j^i &= 0.5\end{aligned}$$

The weights are equal for all:  $\lambda_i = 1$ . Endowments are equally distributed:  $e_j^i = \frac{1}{n}$ . The constraints include the market clearing:

$$\sum_{i=1}^N x_j^i \leq \sum_{i=1}^N e_j^i, \quad j = 1, \dots, M$$

and non-negativity:  $x_j^i \geq 0$ .