Microeconomic Theory I.
Fall, 2023.
Problem Set 6.

Due: Tuesday, November 28, in class.

Exercises: 10.C.2, 10.C.10, 10.D.1, 10.D.2, 16.C.2.

1. Consider an economy with two goods (good l and a *numeraire good)*, 36 identical consumers, $i = 1, ...36$, and 3 firms, $j = 1, 2, 3$. Let x_i denote consumer $i's$ consumption of good l and m_i her consumption of the *numeraire.* The consumption set of every consumer is $\mathbb{R} \times \mathbb{R}_+$.The utility function of each consumer is given by:

$$u_i(m_i, x_i) = m_i + \sqrt{x_i}, i = 1, ...36.$$

Firm $j = 1, 2, 3$ produces q_j units of good l using amount $c_j(q_j)$ of the *numeraire* good where

$$\begin{aligned} c_j(q_j) &= 3(q_j)^2, j = 1, 2 \\ &= 4q_j, j = 3. \end{aligned}$$

Assume there are no externalities.

(i) Derive the industry's marginal cost curve.

(ii) What is the consumption and production allocation for good l in any Pareto efficient allocation?

(iii) Suppose that the initial endowment of the numeraire good for each consumer i is equal to 10. Further, firms $j = 1, 2, 3$, are *solely owned* by consumers $1, 2$ and 3 respectively. Describe the competitive equilibrium allocation and the utilities of agents $i = 1, ...36$ in this equilibrium.

(iv) Suppose that a tax of \$1 per unit is imposed on the production of good l. Derive the deadweight loss (of social surplus) caused by this tax