

EconS 503 - Microeconomic Theory II
Homework #3 - Due date: Friday, February 14th.

1. **Exercises from Tadelis:**

(a) Chapter 6: Exercises 7, 9, and 11.

2. **Cournot game.** Consider an industry with $N \geq 2$ firms competing a la Cournot, facing inverse demand function $p(Q)$, where $Q = \sum_{i=1}^N q_i$ denotes aggregate output, which is strictly decreasing and strictly concave, i.e., $p'(Q) < 0$ and $p''(Q) < 0$. Firm i faces cost function $c_i(q_i)$, which satisfies $c_i(0) = 0$ and is strictly increasing and strictly convex, i.e., $c'_i(q_i) > 0$ and $c''_i(q_i) > 0$.

(a) Find the implicit function describing the equilibrium output of every firm i , q_i^* .

(b) Consider now a regulator seeking to maximize social welfare, defined as

$$SW = \int_0^Q p(Q)dQ - \sum_{i=1}^N c_i(q_i).$$

Find the implicit function describing socially optimal output of every firm i , q_i^{SO} .

(c) Show that $q_i^* < q_i^{SO}$.

3. Consider an industry with $N \geq 2$ firms competing a la Cournot, facing inverse demand function $p(Q) = a - bQ$, and symmetric cost function $c(q_i) = cq_i + \frac{d}{2}q_i^2$, where $a > c$, $d < 0$, $d + 2b > 0$, and $d + b < 0$. You may also assume that $\frac{a-c}{2b+d} < -\frac{c}{d}$ to avoid settings with negative costs.)

(a) Find equilibrium output for every firm i , q_i^* .

(b) Find aggregate output in equilibrium, Q^* .

(c) Show that Q^* decreases with entry.