

EconS 424 - Strategy and Game Theory
Homework #3 - Due date: February 6th, in class.

1. **Exercises from Harrington:**

- (a) Chapter 6: Exercises 10 and 12.
- (b) Chapter 7: Exercise 12.

2. [**Cournot competition with N firms**] There are three identical firms in the industry. The inverse demand function is $p(Q) = 1 - Q$, where $Q = q_1 + q_2 + q_3$ denotes aggregate output. To facilitate your calculations, assume that the marginal cost for all firms is zero, $c = 0$.

- (a) Find the best response function for each firm. Interpret.
- (b) Compute the Cournot equilibrium.
- (c) Assume that two of the three firms merge (transforming the industry into a duopoly). Show that the profit of the two merging firms decreases but the profit of the unmerged firm increases. Explain.
- (d) Assume now that all three firms merge. Show that the profits of all firms increase. Interpret your results in parts (c) and (d).

BONUS EXERCISE:

3. [**Cournot mergers with efficiency gains**] Consider an industry with three identical firms each selling a homogenous good and producing at a cost $c > 0$. Industry demand is given by $p(Q) = 1 - Q$, where $Q = q_1 + q_2 + q_3$ denotes aggregate output. Competition in the marketplace is in quantities (a la Cournot).

- (a) Find the equilibrium quantities, price and profits.
- (b) Consider now a merger between two of the three firms, resulting in duopolistic structure of the market. The merger might give rise to efficiency gains, in the sense that the firm resulting from the merger produces at a cost $e \times c$, with $e \leq 1$ (whereas the outsider still has a cost c).
 - 1. Find the post-merger equilibrium quantities, price and profits.
 - 2. Under which conditions does the merger reduce prices?
 - 3. Under which conditions is the merger beneficial to the merging firms?