

Problem set 3

Econ 460

Due Monday: November 17

1. OZ Shy: Exercises 6.8: 1,2,4,6

2. There are five (5) identical firms that build ocean-going ships. Market demand for ships is given by  $P(Q) = 110 - Q$ . Each ship builder has constant marginal cost of  $c = 10$ , but no fixed costs.

a) Suppose all five ship builders form a cartel. Assuming they agree to maximize their joint profit, find the equilibrium price, as well as the individual ship builder's quantity and profit.

b) Now suppose that firm 1 chooses to leave the cartel. Express firm 1's best response as a function of the production level of the 4-member cartel,  $Q_{\text{cartel}}$ . [Note: this is just a Cournot firm's best response function.]

c) The cartel members recognize the dependence of firm 1's output on their production and can commit to its output. Find the profit maximizing output of the 4-member cartel given these expectations. [Note: the cartel as a group acts as a Stackelberg leader and firm 1 as a follower.]

d) Find the amount produced by the nonmember in equilibrium, and use it to calculate the total amount produced under this arrangement, along with the equilibrium price.

e) Compute the profit of an individual cartel member and of the nonmember, and then compare to the profit levels in part (a) before firm 1 defected.

f) Give your intuition as to why a firm would want to leave the cartel? Why would a firm want to be a part of the cartel?

g) Is it possible that the four (4) cartel members could “bribe” firm 1 not to leave the cartel? Explain.

3. Outtel and Moon Microsystems produce high-end processors that are sold to high-end server manufacturers. The companies’ products are considered identical by purchasers. Market demand is given by:  $Q(p) = 500 - 2p$ . Outtel has a constant marginal cost of production of 50, while Moon has a higher marginal cost of 100. Both firms’ fixed costs are sunk.

a) Find the Cournot equilibrium quantities produced by each of these duopolists, along with the corresponding equilibrium market price and firms’ profits.

b) Draw each firm’s best-response function on a graph. Label the axes and various points, including the Cournot equilibrium.

c) Using your diagram in (b), insert one point that has the property that it satisfies each of the following two conditions:

i) both firms prefer to increase their production.

ii) Outtel does not wish to change its output, but Moon prefers to reduce its output.

Now suppose that the two firms set price as Bertrand competitors but they continue to have different costs.

d) What will be the Bertrand equilibrium price in that case? Explain why we no longer have the so-called “Bertrand paradox.”

e) Using the Bertrand equilibrium, compute total industry output and profit of each firm.

f) Draw each firm's Bertrand best-response function on the same graph. Label the equilibrium.

Now suppose the California energy crisis occurs. Outtel produces their chips in Oregon, and has long-term contracts for energy supply, so their marginal cost is unchanged. Moon Microsystems, on the other hand, produces in California, and they buy energy on the spot market. Their marginal cost doubles because of the energy crisis.

g) What is the new Cournot equilibrium quantities and the corresponding market price and firms' profits?

h) Indicate how each firm's best-response functions change as a result by graphing the firms' best-response functions before and after the energy crisis.