

**EC 501: Problem Set 11**  
**(Due in class on Tuesday, November 26)**

1. There are two firms (1 and 2) that sell bottled water in Oligopolis. Each firm can produce the water at zero cost. The demand curve for bottled water is

$$Q^d = 300 - p,$$

where  $p$  is its price.

- (a) Suppose the firms are Cournot competitors. What will be each firm's output level, the price in the market, and each firm's profits, in the Cournot equilibrium?
- (b) Suppose instead that firm 1 is a Stackelberg leader, while firm 2 plays Cournot. Find each firm's output, the market price, and each firm's profits under this assumption.
- (c) Finally, suppose firm 2 has not yet actually entered the bottled water market but could do so at a cost of 900. The game being played by the two firms is a two-stage game in which firm 1 chooses its output first and then firm 2 can decide whether or not to enter the market. If firm 2 enters, it will play its Cournot best-response strategy. What is firm 1's profit-maximizing output choice now? How much profit will each firm make in this scenario?
2. There are just two firms, 1 and 2, in the widget industry. They each produce widgets at a fixed cost of \$1000 per month and have no variable costs. The respective monthly demand curves they face are

$$q_1 = 120 - 2p_1 + p_2$$

$$q_2 = 120 - 2p_2 + p_1$$

The firms engage in Bertrand competition.

- (a) Find the Bertrand equilibrium in the simultaneous move game where the firms set their prices at the same time. Find the firms' best response functions and draw them in a clearly labeled diagram. Then find the equilibrium values of  $p_1, p_2$  and label this point B in your diagram. Find each firm's profit levels.
- (b) Now answer question (a) for the sequential game in which firm 1 chooses its price first. Find the equilibrium values of  $p_1, p_2$  and label this point S in your diagram. Find each firm's profit levels. Explain the relationship between the profit levels in this case as compared to the profits seen in part (a).