
ECON 302: Assignment 3
Winter 2016, Instructor: Huan Xie
Due 12pm March 18th, Friday, put in my mailbox

1. Consider two firms, 1 and 2, each producing an identical good simultaneously. This good has market demand given by the inverse demand function $p = 10 - 2Y$, where p is price, and $Y = y_1 + y_2$ is market quantity. y_i represents the amount produced by firm i . Suppose production cost is zero for both firms. (30 points)
 - (1) Solve algebraically for these firms' reaction functions, expressing each firm's optimal output level given some level of its competitor's output.
 - (2) Graph these reaction functions and show the equilibrium point. Include isoprofit contours through the equilibrium point for both firms.
 - (3) Solve algebraically for the equilibrium: Determine the equilibrium market price, as well as each firm's equilibrium quantity and profit.
 - (4) Solve for the collusive outcome in which two firms split monopoly profits. Is the profit for each firm in the collusive outcome larger than in the non-collusive outcome? Do you think firms will choose the quantities in the collusive equilibrium? Why?

2. Consider the same industry outlined in question 1 except that the marginal cost for each firm is 1. Imagine that firms choose prices rather than quantities. Consumers split themselves evenly across the firms if the firms set the same prices, otherwise all consumers shop at the lower-priced firm. (20 points)
 - (1) Define a Nash equilibrium in prices p_1 and p_2 .
 - (2) Explain why the prices p_1 and p_2 you propose is an equilibrium.

3. Consider the following duopoly industry. Demand is given by $p = a - bY$, where p is price, and $Y = y_1 + y_2$ is market quantity. y_i represents the amount produced by firm i . The two firms have the same marginal cost equal to c . Assume a is large enough and there is no fixed cost. (50 points)

(1) In a Cournot model (two firms decide their output levels simultaneously and independently), solve each firm's output quantity and profit, market price, and market quantity.

(2) Now suppose two firms collude to decide their output levels together and split the market demand equally. Solve each firm's output quantity and profit, market price, and market quantity.

(3) Now suppose two firms move sequentially and firm 1 is the leader (Stackelberg model). Solve each firm's output quantity and profit, market price, and market quantity.

(4) Put your results from the previous three sub-questions in the following table.

	y_1	y_2	Y	p	π_1	π_2
Cournot Model						
Collusion						
Stackelberg Model						

(5) Compare your results and explain. (Cournot vs. Collusion and Cournot vs. Stackelberg)