Tutorial 10

1. There are only two firms producing the same product in the market. Cost functions of firms 1 and 2 are $c_1(q_1)=q_1^2$ and $c_2(q_2)=12q_2$ respectively. Q denotes the total output in the market. The inverse demand function is p=100-Q. Suppose the firms are in Cournot competition.
   a. Find the reaction function of each firm.
   b. Obtain the output levels that will be produced in a Cournot-Nash equilibrium, and the price level in such an equilibrium.
   c. Illustrate your solution in a suitable graph.
   d. What will be the profit for each firm?

2. The inverse market demand curve for bean sprouts is given by P(Y)=100-2Y, and the total cost function for any firm in the industry is given by TC(y)=4y.
   a. What is the marginal cost? If the bean-sprout industry were perfectly competitive what would be the total output of the industry and price.
   b. Suppose two firms, A and B, are operating in the market as Cournot competitors. Derive the reaction functions of the firms, the equilibrium level of output each of them will produce, the price at which they can sell the bean-sprouts in the market and their profits? Show the reaction functions and Cournot equilibrium on a suitable diagram.
   c. If the two firms decide to collude to produce equal amount of bean-sprout each such that total profit is maximised, calculate the industry supply and the market price. What would be the quantity produced and the profits of each firm? Why will this be not a stable arrangement – i.e. do the firms have an incentive to deviate? Think about whether this collusion can be sustained in some way?
   d. Suppose firm A acts as a Stackelberg leader, and firm B behaves as a follower. Calculate the equilibrium level of output each firm will produce, the price at which they can sell the bean-sprouts in the market and their profits.

3. Glenrocks is a small remote village in the Highlands there are two bakers who are cousins and neighbours, Anderson and Carlson. The bread produced by both these men come from the same recipe given to them by their grandmother – basically, they produce the same product. They deliver the bread each day to the local shop, which will buy them at a price according to the total number of bread they have produced between them. Carlson and Anderson have to choose the quantity to produce – i.e. they are in Cournot competition.
   The inverse demand function for bread in Glenrocks is $p = 6 - 0.01q$, where q is the total number of loaves sold per day. Fixed costs are assumed to be zero – they cook in their own kitchens. Anderson has a marginal cost of £1 while Carlson's marginal cost is £2 per loaf of bread because he has a comparatively inefficient oven.
   a. Find the reaction functions of Carlson and Anderson, the number of loaves each of them will produce each day to maximise their profit, the price given to them by the local shop and their profits.
   b. Anderson becomes a little lethargic and begins to get up later. So, Carlson bakes his bread first. Anderson can correctly estimate the number of loaves Carlson loads into his van before putting his bread in the oven, so he thinks he has some advantageous information. Do you think he is correct in thinking this? Carlson knows that Anderson peeps through the curtain to get this information. Basically, Carlson can act as a Stackelberg leader. Now, what will be the number of loaves produced by the two bakers, the price they will get and the profits they make? What advice can you give Anderson?