1. A monopolist can produce at a constant average (and marginal) cost *AC* = *MC* = *5*. The market demand curve is *Q* = *53-P*.

(1) Calculate the monopolist's profit-maximizing price and output, and calculate its profit.

(2) Assume that a second vendor joins the market. The output of the first manufacturer is Q_1, and the output of the second manufacturer is Q_2. Market demand function is now $Q_1 + Q_2 = 53 - P$. The second manufacturer has the same cost as the first manufacturer. Calculate the profit of each manufacturer (as a function of Q_1 and Q_2).

(3) Find the "response curve" of each manufacturer. (Assume that each firm chooses its profit-maximizing production level, when its competitor's output is given).

(4) Calculate Cournot equilibrium. What is the market price? What is the profit of each manufacturer? (That is, calculate the value of Q_1, Q_2, *P,* and the profit of each manufacturer based on question (2) and (3))

(5) Now there are N manufacturers in this industry, each has the same cost *AC* = *MC* = *5*. Find Cournot equilibrium. How many products each manufacturer will produce? What will the market price be? And how much profits each manufacturer will make? Also, prove that when N becomes larger, the market price is close to the price under perfect competition.

2. Consider the Bertrand duopoly model with homogeneous products. Suppose that the quantity that consumers demand from i is $a-p_i$ when $p_i < p_j$, 0 when $p_i > p_j$, and $(a – p_i)/2$ when $p_i = p_j$. Suppose also that there are no fixed costs and that marginal costs are constant at c, where c < a. Show that if the firms choose prices simultaneously, then the unique Nash equilibrium is that both firms charge the price c.

3. The game being played is the one shown below; call this the "true" game

		2: L	2: R
1	T	6, 3	0, 9
	B	3, 3	3, 0

Player 1 knows that she is playing this game, while Player 2 is uncertain as to whether she is playing this game or a different game, shown below, where the payoffs of Player 1 are different:

		2: L	2: R
1	T	0, 3	3, 9
	B	3, 3	0, 0

For convenience, refer to the “true game” as the game where Player 1 is of type *b* and the “different game” as the game where Player 1 is of type *a*.

Suppose that Player 2 assigns probability $\frac{2}{3}$ to Player 1 being of type *a* and probability $\frac{1}{3}$ to Player 1 being of type *b*. Find a Nash equilibrium.

4. Consider a Cournot duopoly operating in a market with inverse demand $P(Q) = a - Q$, where $Q = q_1 + q_2$ is the aggregate quantity on the market. Both firms have total costs $c_i(q_i) = cq_i$, but demand is uncertain: it is high ($a = a_H$) with probability θ and low ($a = a_L$) with probability $1-\theta$. Furthermore, information is asymmetric: firm 1 knows whether demand is high or low, but firm 2 does not. All of this is common knowledge. The two firms simultaneously choose quantities. What are the strategy spaces for the two firms? Make assumptions concerning a_H, a_L, θ, and c such that all equilibrium quantities are positive. What is the Bayesian Nash equilibrium of this game?

5. The following static game of complete information (Matching Pennies) has no pure-strategy Nash equilibrium but has one mixed-strategy Nash equilibrium: each player plays *H* with probability $\frac{1}{2}$.

		2: H	2: T
1	H	1, -1	-1, 1
	T	-1, 1	1, -1

Provide a pure-strategy Bayesian Nash equilibrium of a corresponding game of incomplete information such that as incomplete information disappears, the players’ behavior in the Bayesian Nash equilibrium approaches their behavior in the mixed-strategy Nash equilibrium in the original game of complete information.

Hint: Consider the following Bayesian game in which t_1 and t_2 are independently and uniformly distributed on $[0, x]$.

		2: H	2: T
1	H	$1+t_1$, -1	-1, $1-t_2$
	T	-1, 1	1, -1