

## Game Theory: Exercise 5

### *Repeated games*

1.

### Oligopoly and Collusion when firms compete a la Cournot

Assume there are two firms competing in quantities (*a la Cournot*) with zero marginal costs and a demand function given by:

$$p(q_1, q_2) = 1 - q_1 - q_2$$

So the profit function for firm 1 is:

$$\pi_1(q_1, q_2) = p \cdot q_1 = (1 - q_1 - q_2) \cdot q_1$$

$$\pi_1(q_1, q_2) = q_1 - q_1^2 - q_1q_2$$

- i. Find the equilibrium if the game is played just one time.
- ii. Find the equilibrium in a cartel (that is if the two firms collude).
- iii. Can they achieve cooperation?

2.

### Exercise 14.3 Harrington.

In the stage game in the Anti-Ballistic Missile Treaty (or ABM Treaty) Game

		Soviet Union		
		<i>No ABMs</i>	<i>Low ABMs</i>	<i>High ABMs</i>
United States	<i>No ABMs</i>	10 , 10	6 , 12	0 , 18
	<i>Low ABMs</i>	12 , 6	8 , 18	2 , 14
	<i>High ABMs</i>	18 , 0	14 , 2	3 , 3

Suppose a technological advance improves the monitoring technology, so that the probability of detecting ABMs are as:

HIGHER MONITORING PROBABILITIES IN THE ABM TREATY GAME	
<i>Number of ABMs</i>	<i>Probability of Detecting ABMs</i>
None	0
Low	.30
High	.75

Using the strategy profile just described, derive the equilibrium conditions. If you answer correctly, then you will find that the restriction on the discount factor is less stringent, indicating that better monitoring makes cooperation easier.