Dimitrios Zormpas Homework on Bayesian Games

Exercise 1: (Final 2020, 15 points) Consider the Cournot duopoly model in which two firms, 1 and 2, simultaneously choose the quantities they supply, q_1 and q_2 . The price each will face is determined by the market demand function $p(q_1, q_2) = a - b(q_1 + q_2)$. Each firm has a probability μ of having a marginal unit cost of c_L and a probability $1-\mu$ of having marginal unit cost of c_H . These probabilities are common knowledge, but the true type is revealed only to each firm individually. Solve for the *Bayesian Nash equilibrium*.

Exercise 2: (Final 2019, 30 points) *Bayesian Games.* Two friends – we will call them Anatoli and Milad – will *simultaneously* decide which movie to go (they don't have much of a communication). The alternatives are The Shining and The Blues Brothers. There is a possibility that Anatoli had a nightmare the previous night. Anatoli *knows* whether he had a nightmare or not. Milad *does not know* whether Anatoli had a nightmare the previous night, but he thinks both possibilities are equally likely (probability 1/2).

The payoffs in case Anatoli had a peaceful sleep are (Anatoli is the "row-player", Milad is the "column-player") given in the following table:

	Milad		
		Shining	Blues Brothers
Anatoli	Shining	2, 1	0, 0
	Blues Brothers	0, 0	1, 2

The payoffs if Anatoli had a nightmare are:

		Milad	
		Shining	Blues Brothers
Anatoli	Shining	2 - x, 1	-x, 0
	Blues Brothers	0, 0	1, 2

All of this is common knowledge between the two players.

(5) a) How many pure-strategy Bayesian strategies does each player have?

(10) b) Find all pure-strategy Bayesian-Nash equilibria if x = 3.

(15) c) Find all pure-strategy Bayesian-Nash equilibria if x = 1.