Problem Set #8 Name:_____
PAI 723
Professor John McPeak

1) Consider two herders. Each herder can choose to place zero, one, or two animals on the common pasture. Assume these are cows, and the cows produce milk that the herders consume. Total milk production is a function of aggregate herd size. Zero animals gives zero milk. 1 animal give 5 liters of milk. 2 animals gives 8 liters of milk. 3 animals gives 9 liters of milk. 4 animals also gives 9 liters of milk. Each herders share of the milk reflects their share of the total herd (so if the total herd size is 3, you own one of them, you get 1/3rd of the nine liters). Each animal costs the equivalent of 1 liter of milk for the herder to place on the pasture, in terms of labor time and the capital value of the animal. Define the payoffs to each herder. (to continue the above example, if total herd size is three, I have one of them, my payoff is (1/3)*9 liters -1, or 2, the other herder gets (2/3)*9-2 (since they have 2 animals to account for the total of three), for a payoff of 4.

	Herder 2			
Herder 1		0 cows	1 cow	2 cows
	0 cows			
	1 cow			
	2 cows			

a) Define the full set of best response strategies for each herder.

b) What is the outcome of this game and what is this type of solution called?

c) Assume we decide to give herder 1 exclusive title deed to the pasture. We can do stuff like that. If herder 1 agrees to allow herder 2 to use the pasture if herder 2 pays the equivalent of 1 liter of milk per animal, what will be the payoff structure?

	Herder 2			
Herder 1		0 cows	1 cow	2 cows
	0 cows			
	1 cow			
	2 cows			

d) What is the full set of best response strategies?

e) What is the outcome of this game and what is this type of solution called?

f) Does this outcome increase or decrease the total payoff amount?

g) Does this outcome improve in the Pareto sense on the outcome of the original game? Why or why not.

h) Compare the tenure reform policy described above with a uniform herd size quota policy that lets each herder have a maximum of one cow on the commons under the original scenario. What is the outcome of this policy?

i) Does the uniform herd quota outcome improve in the Pareto sense on the outcome of the original game?

2) Assume you are given the following matrix of profit for two firms. The firms choose a level of production. The left hand side payoff (profit) is to the coal burning plant, the right hand side payoff is to the laundry.

	Laundry that uses clotheslines			
Coal burning plant		None	Low	High
	None	0, 0	0, 12	0, 11
	Low	10, 0	10, 10	10, 8
	High	14, 0	14, 2	14, 1

a) Does the payoff matrix indicate that both firms are imposing a negative externality on each other, one firm is imposing a negative externality on the other, or that there is no negative externality imposed by either firm on the other? Explain your answer.

b) What is the Nash equilibrium outcome of this game in terms of levels of production and payoffs if each firm plays their best response strategy?

c) Does a policy that gives the Laundry first mover status lead to the socially efficient outcome? Why or why not?

3) Market structure, externalities, and taxation. The inverse demand curve is given as p=100-q. The supply curve is p=10+q.

a. What is the equilibrium price quantity pair if the market structure is perfectly competitive?

b. What is the equilibrium price quantity pair if production of the good imposes an externality defined by $MC^E = 0.5*q$ and the market structure is perfectly competitive?

c. What Pigovian tax can be defined as a specific tax on producers in the perfectly competitive market to arrive at the socially optimal price- quantity pair?

d. In terms of economic efficiency, does it matter whether we place this tax on consumers or producers? Why does it matter or why does it not matter?

e. What is the equilibrium price quantity pair if the market structure is a monopoly?

f. Draw a graph of the perfectly competitive and monopoly results.

g. Calculate for the monopoly result and the perfectly competitive result the following.

	PERFECTLY COMPETITIVE	MONOPOLY
Producer Surplus		
Consumer Surplus		
Negative Externality		
Total Social Welfare		