Problem Set #9 Name:_____
PPA 723

1) Public Goods.
   a. Define the concepts of rivalry and exclusion as they apply to goods, and use them to illustrate the difference between private and public goods.

   b. Fill in the table with: private good, public good, club good, and open access good.

	Exclusion Possible	No Exclusion Possible
Rivalry		
No Rivalry		

   c. Discuss how and why derivation of the demand curve for public goods differs from the derivation of the demand curve for a private good.

2) Two people live next door to each other on a bay, and are the only residents on the bay. During storms, high waves cause property damage on each person's property. By building a breakwater near the mouth of the bay, they can avoid this damage to their shoreline. The only place that it is feasible to build this breakwater will provide this protection to both properties. Dorothy owns one of the houses, and spends $13,000 repairing her property from the storm damage. Henry owns the other house, and spends $3,000 repairing his property. Building the breakwater costs $10,000. If they both agree to build it, they share the cost of building equally ($5,000 each).

a. Is the total benefit (as reflected in the benefit of not having to pay to repair storm damage) greater than the cost? You can assume both the damage repair costs and the building cost are in present value terms.

b. Explain how the Nash Equilibrium outcome of this game illustrates the free rider problem in the provision of public goods.

	Dorothy		
Henry		Build	Don't Build
	Build	-$5,000 -$5,000	-$10,000 $0
	Don't Build	$0 -$10,000	-$3,000 -$13,000

c. Does the free rider problem in this example lead to an inefficient outcome?

2) 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 as follows

Total Number of Cows on the Pasture	Total Milk Produced in Liters
1	5
2	8
3	9
4	9

Each herder's 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 $1/3^{rd}$ of the nine liters). Each liter of milk is worth one dollar and each animal placed on the pasture costs the herder one dollar for labor costs. Fill in the table below with the payoffs to each herder. (to continue the example started above, if total herd size is three, I have one of them, my payoff is [($1*(1/3)*9-($1*1)], or $2, the other herder gets [($1* (2/3)*9)-($1*2)] since they have 2 animals of 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 Nash Equilibrium outcome of this game?

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 herder 1 1 dollar per animal (so total cost to herder two is $2 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 Nash Equilibrium outcome of this game?

f) Does this increase or decrease total welfare?

g) Does this 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 this improve in the Pareto sense on the outcome of the original game?

4) 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?

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