The problem set is due by 1PM Tuesday, January 28, 2003. You may turn in your problem set to my secretary, Patricia Hamad in Baxter 112, or you may give it to me at the beginning of class. Lateness will be penalized.

Be sure to explain your answers and show your work.

For all problems, assume that each party is a selfish (non-altruistic), rational maximizer. That is, each party considers costs and benefits it directly incurs, and that each party chooses the action which maximizes benefits minus costs.

1) Consider the factory-shepherd problem we discussed in class, but now assume that there are 3 shepherds:

F = factory owner
S₁ = shepherd #1
S₂ = shepherd #2
S₃ = shepherd #3
p = percent pollution eliminated
B(p) = dollars F or S₁ or S₂ or S₃ would pay to reduce pollution p %

A) What is the socially optimal amount of pollution reduction?

B) What is the factory owner’s threat value?

C) What are each of the shepherds’ threat values?

D) Is an agreement to reduce pollution possible?

E) Suppose one of the shepherds refuses to pay the factory owner anything to reduce pollution. Is it possible that the factory owner and the other two shepherds might still reach an agreement to reduce pollution?

F) Is an agreement more likely when there is one shepherd (as discussed in class) or three shepherds (as here)? What does this tell us more generally about transactions costs?
2) People tend to value a view of the ocean from their home more the wealthier they are. Suppose, for example, that A’s utility function is \( U_A = W_A + 0.8W_A V_A \), where \( W_A \) is A’s wealth, not including property which or may not have a view, and \( V_A \) is a variable which takes the value 1 if A has a view and zero if A does not have a view. Similarly, B’s utility function is \( U_B = W_B + 0.7W_B V_B \).

A) Who values a view more, A or B?

Suppose that A owns property on the beach, and that B owns property behind A. Since A has not yet developed his property, B has a view of the ocean, but A does not. If A develops his property, he will have a view of the ocean, but B will not. It will cost A $100,000 to develop his property. A and B each have wealth of $1 million, excluding their beach-front and near-beach front property. Consider the following legal rules: (1) Developer’s rights: anyone may develop property, even if it blocks someone else’s view, and (2) View preservation: no one may develop a property if it will block someone else’s view. Each rule is protected by an injunction.

B) If there are no transactions costs, will the two rules lead to different results?

C) What does this tell us about the Coase Theorem more generally.

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3) In class we modeled the tragedy of the commons as follows:

\[
S = \text{the total number of sheep} \\
S_a \text{ is A’s herd} \\
S_b \text{ is B’s herd} \\
S_a + S_b = S \\
B = \text{the total profits from grazing sheep} \\
= 20S - S^2/2
\]

Each shepherd derives profits proportional to the size of its herd

\[
B_a = S_aB/S \\
B_b = S_bB/S
\]

In class, we showed that if shepherds are restricted to 5, 10 or 15 sheep, then the social optimum is that each grazes 10 sheep, and the Nash equilibrium is that each grazes 15 sheep. Suppose the shepherds can graze herds of any positive integer size. What is the social optimum? What is the Nash equilibrium? Is there more than one Nash equilibrium?
4) Under the common law of the 19th century, property owners’ right to exclude went from the center of the earth up to the sky. That is, it was illegal to mine underneath someone else’s property or to cause something to fly over someone else’s property. Both property rights were protected with injunctions. The invention of the airplane caused a debate about the right of airplanes to fly over private property. Among the possible solutions were the following: (1) property owners should continue to be able to procure injunctions against aircraft, (2) property owners should not have the right to injunctions, but rather should be able to procure damages from aircraft owners, and (3) property owners should have no rights against aircraft.

A) Which alternative would be best if there were no transactions costs?

B) Which alternative do you think would be best in the real world?

C) Are there any solutions which might be better than these three?

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5) In the nineteenth century, foxes were thought to be a menace, because they killed chickens and sheep, which farmers were raising for food and wool. What legal rule relating to the acquisition of property rights in foxes do you think would have been best? Consider at least the following possibilities: (a) the first to kill the fox owns the fox (including the fur and meat) and (b) a government auction of licenses to kill foxes.