

100 points total. Answer each question in the space provided, using the back of the sheet if necessary.

1. (20 pts.) Coal and natural gas are two sources of energy that can be found underneath the surface of the ground in Kentucky. Establishing ownership rights that incentivize the optimal rate of extraction may differ for these two resources, however. Explain the two general principles that can be used to solve the problem of establishing ownership, and then explain why the approach that works best for coal might not be best for natural gas.

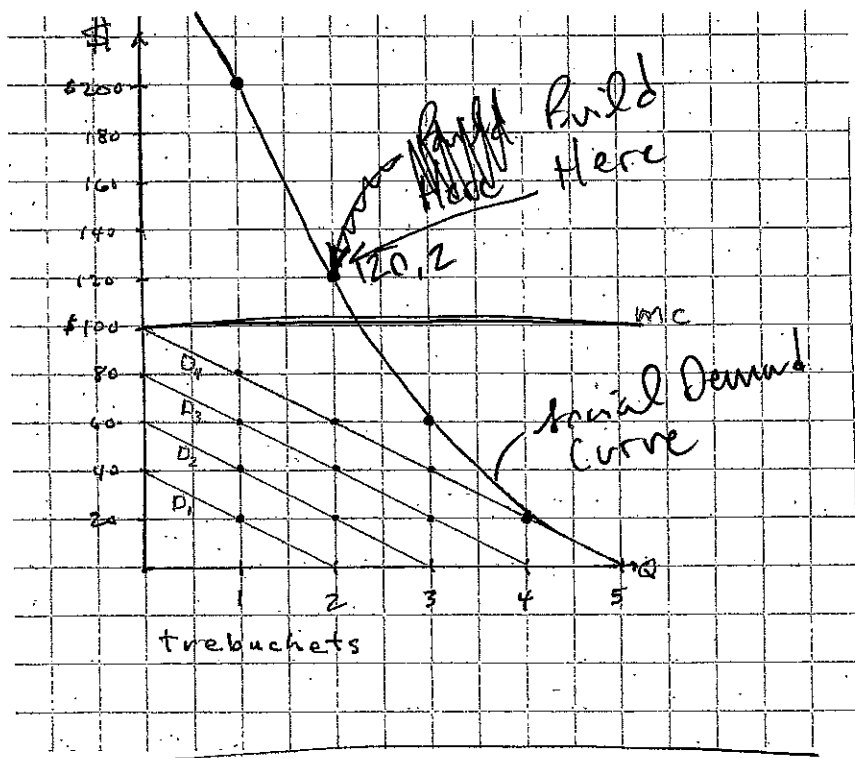
The 2 general principles that can be used for establishing ownership are the right of first possession and tied ownership. The right of first possession allows the first person to extract the resource to possess the resource. This principle makes it easy to establish ownership but it also incentivizes over extraction of the resource. This process may work best for coal because all of the coal is already made and ready to be mined. Tied possession on the other hand gives property rights to the surface owners. This makes ownership more difficult to establish but it promotes extraction at a sustainable rate. This method works best for natural gas because of the manner in which natural gas is extracted. As seen in *Hammonds v. Central Ky. Natural Gas*, the most efficient allocation of property rights came from a tied possession system. This helps to prevent over extraction. The government can sell mineral rights separate from selling land.

to establish who may extract the minerals. This is a provision of tied possession. Separating mineral rights from land rights makes ownership of the resources very clear

good answer

2. (20 pts.) Our island is regularly raided by pirates, who plunder and loot our coconuts, fish, and other possessions. We each individually build fences and install burglar alarms, but none of these efforts are particularly effective against pirates. The most effective pirate deterrent would be a trebuchet. There are four of us on the island, and our individual demands for trebuchets are illustrated below. Trebuchets cost \$100 each to build. How many trebuchets will our island economy produce if private market allocation is relied upon? Is this efficient? What characteristics of trebuchets lead to this outcome? If you were appointed to be secretary of defense by the rest of us, how many trebuchets would you recommend that we produce? Explain your reasoning and illustrate your answer in the diagram.

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- The primary issue is that markets under provide public goods, like trebuchets.
- By itself, the market would provide 0 trebuchets. Since they are not worth  $> \$100$  to any single individual, our island would have no defense. This is clearly not efficient.

The problem is that they are too expensive to build, as such, none are built.

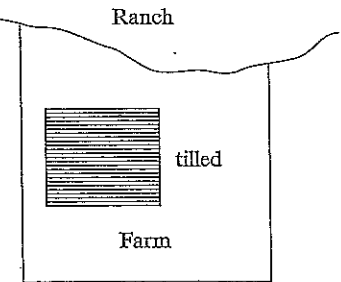
Because they are non-rival, non-excludable public goods, we can sum vertically to find a social demand curve. Using this aggregate, our island would benefit from having 2 trebuchets. We would be willing to pay \$200 for the first, and \$120 for the second. ✓

3. (20 pts.) A rancher and a farmer live adjacent to one another, as illustrated below. The farmer grows corn on some of his land and leaves some of it uncultivated. The rancher runs cattle all over her land. The boundary between the ranch and the farm is clear, but there is no fence. From time to time the cattle wander onto the farmer's property and damage the corn, reducing the farmer's profits by \$100 per year. The cost of installing and maintaining a fence around the farmer's cornfields is \$50 per year, and the cost of installing a fence around the ranch is \$75 per year. (a) The farmer decides to sue the rancher for the damage her cattle cause. The court decides in favor of the farmer, and enjoins the rancher's cattle from wandering onto the farmer's land and eating his corn. Will this decision lead to an inefficient outcome? Explain why or why not. (b) Suppose the two parties decide to merge and form one mega-farm. What approach will the merged firm take towards corn, cattle, and fences? Explain.

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If the court rules in favor of the farmer and enjoins the rancher from letting his cattle spill over onto the corn, the situation will lead to an inefficiency.

~~It saves the farmer~~ The Rancher will build a fence @ \$75, saving him \$25. If the farmer had built the fence @ \$50, it would save him \$50.

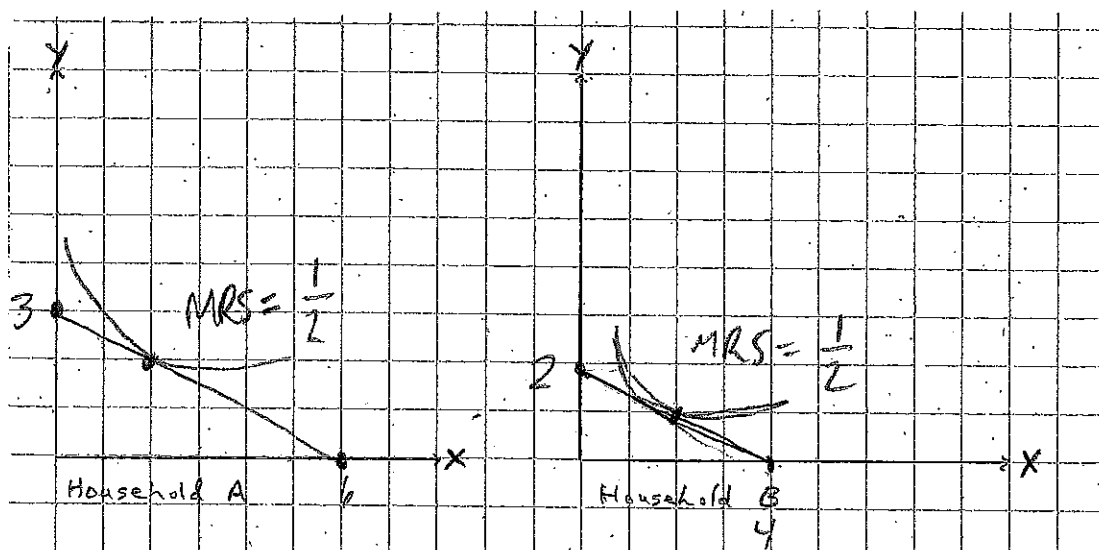


If the two parties merged to create a mega-farm, the mega-farm will build a fence around the corn fields because they would be trying to maximize their profits.

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In the first question, they could bargain with each other, assuming transaction cost were low, and reach a point which is mutually beneficial to both parties. Rancher says, "I'll pay you \$50 to fence your field." Farmer responds, "It would cost me \$50 anyway, plus you're saving \$25 from not building your fence." Rancher replies, "How about we split the \$25 that I save and pay you \$62.50. The farmer agrees and that is the Coase Theorem at work." ✓

good answer

4. (20 pts.) A necessary condition for Pareto optimality is efficiency in exchange. Explain what is meant by efficiency in exchange, i.e. describe explicitly what it requires. Then explain and illustrate how competitive markets lead to efficiency in exchange. For your illustration, consider two representative households, A and B, having respective incomes  $I_A$  and  $I_B$ , consuming two goods, X and Y, and facing market prices  $P_X$  and  $P_Y$ .



if  $P_Y = 4$  and  $P_X = 2$   
and  $I_A = 12$  and  $I_B = 8$

Efficiency in exchange  
 $MRS_{X,Y}(A) = MRS_{X,Y}(B)$

Market prices mean that everyone in the market will face the same price for a specific good. If that is true, then  $\frac{P_X}{P_Y}(A) = \frac{P_X}{P_Y}(B)$

and  $\frac{P_X}{P_Y} = \frac{MC_X}{MC_Y} = MRS_{X,Y}$ , then  $\underline{MRS_{X,Y}(A) = MRS_{X,Y}(B)}$ .

From the graph, you can see that even with different income levels, the slope ( $MRS_{X,Y}$ ) is the same for both. They just each need to find the point on the highest indifference curve for efficiency

5. (20 pts.) Exchanges between individuals involving private goods do not raise concerns about efficiency because voluntary exchanges never move scarce resources from higher-valued uses to lower-valued uses. When government uses its power of eminent domain to acquire property, however, inefficiencies may occur. Two cases involving government takings were *Kelo v. City of New London* and the acquisition of property by UK on Columbia Circle for the construction of Young Library. Describe the facts these cases, and discuss whether the above-mentioned concern about efficiency was a factor in each case.

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IN *KELO VS. CITY OF NEW LONDON*, THE GOVERNMENT'S POWER OF EMINENT DOMAIN WAS USED DIFFERENTLY THAN NORMAL. TYPICALLY, PRIVATE PROPERTY TAKEN BY THE GOVERNMENT IS PUT TO PUBLIC USE. HOWEVER, IN THIS CASE, THE PRIVATE PROPERTY WAS TRANSFERRED TO ANOTHER PRIVATE OWNER. THIS WAS DONE UNDER THE "TAKINGS CLAUSE" OF THE FIFTH AMENDMENT TO THE CONSTITUTION. THE CASE WAS DECIDED BY THE SUPREME COURT, WHO DEEMED THIS ACTION CONSTITUTIONAL. THEIR DECISION WAS BASED ON THE FACT THAT ECONOMIC GROWTH WOULD BENEFIT OTHERS WITHIN THE COMMUNITY, AND THEREFORE THIS REALLOCATION OF LAND FROM ONE PRIVATE USER TO ANOTHER QUALIFIED AS BEING PUT TO "PUBLIC USE." IN THIS INSTANCE, INEFFICIENCY RESULTED: THE LAND WAS NEVER DEVELOPED BECAUSE THE DEVELOPERS FAILED TO SECURE FINANCING.

UK WANTED TO PURCHASE A COUPLE'S HOME ON COLUMBIA CIRCLE TO BUILD THE WILLIAM T. YOUNG LIBRARY. UK'S APPRAISER APPRAISED THE HOUSE AT \$80,000; HOWEVER THE COUPLE WANTED \$90,000 FOR THEIR PROPERTY. BECAUSE UK WAS NOT ALLOWED TO PAY MORE THAN THE APPRAISAL VALUE, THEY CONSIDERED USING THE TAKINGS CLAUSE. KIRKPATRICK & COMPANY (A REAL ESTATE FIRM) BOUGHT THE HOUSE FROM THE COUPLE FOR \$90,000, SOLD IT TO UK FOR \$80,000, AND CONSIDERED THEIR \$10,000 LOSS TO BE A DONATION. INEFFICIENCIES [LOSS OF TIME, MONEY FOR COURT FEES, ETC] WERE AVOIDED BECAUSE OF THE WAY THIS CASE

good  
man