Exam #2 (100 Points Total)

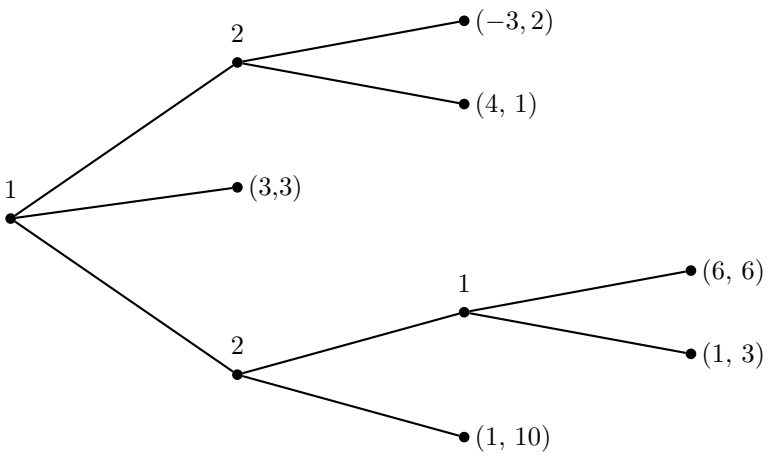
- Take the exam during an *uninterrupted period of no more than 3 hours.* (It should not take that long.) The space provided below each question should be sufficient for your answer, but you can use additional paper if needed. *You are encouraged to show your work for partial credit.* It is very difficult to give partial credit if the only thing on your page is "$x = 3$".
- *Other than this cheat sheet, all you are allowed to use for help are the basic functions on a calculator.* Partial translation: no books, no notes, no websites, no talking to other people, and no advanced calculator features like programmable functions or present value formulas.
- People who have taken the exam can talk to each other all they want, and people who have not taken the exam can talk to each other all they want, but communication between the two groups about class should be limited to three phrases: "Yes", "No", and "Have you taken the exam?"
- For questions or other emergencies, call me at x5124 or 206-351-5719.
- **Expected value** is given by summing likelihood times value over all possible outcomes:

$$\text{Expected Value} \quad = \sum_{\text{Outcomes } i} \text{Probability}(i) \cdot \text{Value}(i).$$

- A **Pareto efficient** (or **Pareto optimal**) allocation or outcome is one in which it is not possible find a different allocation or outcome in which nobody is worse off and at least one person is better off. An allocation or outcome B is a **Pareto improvement over A** if nobody is worse off with B than with A and at least one person is better off.
- A (strictly) **dominant strategy** for player X is a strategy which gives player X a higher payoff than any other strategy *regardless of the other players' strategies.*
- In an **ascending price auction**, the price starts out at a low value and the bidders raise each other's bids until nobody else wants to bid. In a **descending price auction**, the price starts out at a high value and the auctioneer lowers it until somebody calls out, "Mine." In a **first-price sealed-bid auction**, the bidders submit bids in sealed envelopes; the bidder with the highest bid wins, and pays an amount equal to his or her bid (i.e., the highest bid). In a **second-price sealed-bid auction**, the bidders submit bids in sealed envelopes; the bidder with the highest bid wins, but pays an amount equal to the *second-highest* bid.

(5 points) Name:

1. Analyze the following sequential move game using backward induction.



   (a) (5 points) Identify (e.g., by circling) the likely outcome of this game.

   (b) (5 points) Is this outcome Pareto efficient? Yes No (Circle one. If it is not Pareto efficient, identify, e.g., with a star, a Pareto improvement.)

2. "A Pareto efficient outcome may not be good, but a Pareto inefficient outcome is in some meaningful sense bad."

   (a) (5 points) Give an example or otherwise explain, as if to a non-economist, the first part of this sentence, "A Pareto efficient outcome may not be good."

   (b) (5 points) Give an example or otherwise explain, as if to a non-economist, the second part of this sentence, "A Pareto inefficient outcome is in some meaningful sense bad."

3. (5 points) "If situation A is Pareto efficient and situation B is Pareto inefficient, situation A must be a Pareto improvement over situation B." Do you agree with this claim? If so, explain. If not, provide a counter-example or otherwise explain.

4. Consider a division problem such as the division of cake or the allocation of fishing quotas.

   (a) (5 points) Economists tend to place a great deal of importance on providing opportunities to trade (e.g., allowing the buying and selling of fishing quotas). Briefly explain why this is.

   (b) "Even if there are opportunities to trade, the initial allocation of resources (e.g., the determination of who gets the fishing quotas in an ITQ system) is important because it helps determine whether or not we reach *the* Pareto efficient allocation of resources."

      i. (5 points) Is there such a thing as "*the* Pareto efficient allocation of resources"? Circle one (Yes No) and explain briefly.

      ii. (5 points) Do you agree that initial allocations are important in order to achieve Pareto efficiency, or do you think that they're important for a different reason, or do you think that they're not important? Support your answer with a brief explanation.

5. Catalytic converters are devices that reduce the amount of pollution produced by motor vehicles. Imagine that each of the 500,000 residents of X-ville (including you) owns a car without a catalytic converter, and that each of you has to decide whether or not to purchase one. Imagine further that (1) it will cost you $100 to purchase and install a catalytic converter; (2) *each* car that does not have a catalytic converter results in extra pollution that imposes health costs of one-tenth of one penny ($0.001) on you and every other resident of the city; and (3) like your fellow X-villians, you just want to do whatever has the lowest cost for you personally.

   (a) (5 points) If you and other X-ville residents are each allowed to choose whether or not to purchase a catalytic converter, what outcome does game theory predict?

   (b) (5 points) Is this outcome Pareto efficient? Explain briefly, e.g., by identifying a Pareto improvement if the outcome is Pareto inefficient.

   (c) (5 points) "The central difficulty here is that each resident must decide what to do without knowing what the other residents are doing. If you knew what the others decided, you would behave differently." Do you agree with this argument? Circle one (Yes No) and briefly explain.

6. It just so happens that eBay is currently running an auction for a collection of *all five* *NSYNC bobblehead dolls. Imagine that your value for such a collection is $20, meaning that you are indifferent between having the dolls and having $20.

   (a) (5 points) In a first-price sealed bid auction, should you bid an amount b that is (less than equal to more than) your true value ($20)? Circle one and explain briefly. It may help to write down an expected value calculation.

   (b) (5 points) In a second-price sealed bid auction, explain why it makes sense to bid your true value (i.e., $20). In other words, explain why bidding your true value is a dominant strategy. *Hint:* Consider the highest bid *excluding* your own bid. If that bid is more than $20, can you do better than bidding your true value? If that bid is less than $20, can you do better than bidding your true value?

   (c) (5 points) Your friend Ed needs some cash, so he decides to auction off his prized collection of *NSYNC bobblehead dolls. You suggest a second-price sealed bid auction, to which he says, "Second price? Why should I accept the *second-highest* price when I can do a first-price sealed bid auction and get the *first-highest* price?" Write a response. *Hint:* Think about your answers to the first two auction questions above.

7. Consider the following version of the Ultimatum Game: Player 1 begins by proposing a take-it-or-leave-it division of ten $1 bills between himself and Player 2. (For the sake of simplicity, assume that he has only three options: he can keep $9 himself and offer $1 to Player 2, or he can keep $5 himself and offer $5 to Player 2, or he can keep $1 himself and offer $9 to Player 2.) Player 2 then either accepts or rejects the offer. If she accepts the offer, the players divide up the money and the game ends; if she rejects the offer, both players get nothing.

   (a) (5 points) Draw a game tree for this game.

   (b) (5 points) *Assuming that each player's sole motivation is to get as much money as possible*, backward induction predicts that the outcome of this game will be for Player 1 to choose the first option (keeping $9 for himself and offering $1 to Player 2) and for Player 2 to accept his offer. Explain—as if to a non-economist—the underlying logic here, either in words or using the game tree. (Note: if you think backward induction predicts a different solution, well, explain that one.)

(c) Daniel Kahneman and Vernon Smith won the 2002 Nobel prize in economics for exploring how real people actually make decisions in games like these. (Amos Tversky would have won the prize, too, but he died in 1996.) In classroom experiments, Player 1 sometimes offered Player 2 more than $1, and—in situations where Player 1 did offer Player 2 only $1—Player 2 sometimes rejected the offer. For each of the following statements, indicate whether it is true or false *on the basis of these experimental results* and provide a brief sentence of explanation.

i. (5 points) These experiments showed that some of the Player 2's were not motivated solely by getting as much money as possible.

ii. (5 points) These experiments showed that some of the Player 1's were not motivated solely by getting as much money as possible.

iii. (5 points) These experiments showed that the basic assumption of economics (that decisions are made by optimizing individuals) is wrong.