Final exam

Instructions: You have 120 minutes to complete this exam. Write your answers on the sheets of paper provided to you. Credit, including partial credit, will depend principally on your explanations, so be sure to write thorough answers. Unsupported answers will receive 0 credit. Good luck!

Problem 1 (15 points) Chalky's Bookcases is a monopoly supplier of a much-desired type of bookcase; currently, they produce 4 bookcases/month and sell all of them at a price of $1,000 each. The total cost of producing 4 bookcases is $600.

Chalky's is considering increasing its production to 5 bookcases/month. The marginal cost of the 5th bookcase would be $200. Chalky's cannot price discriminate, and selling a 5th bookcase will require lowering the price to p. What must be true of p for this increase in production to be profitable?

Problem 2 (15 points) Little Airlines' Lexington-Mumbai route is flown by both tourists and business travelers. Tourists ($\frac{1}{2}$ of all travelers) have demand $p = 30 - q$ for quality level q, while business travelers ($\frac{1}{2}$ of all travelers) have demand $p = 60 - q$. For the sake of simplicity, assume that it does not cost the airline anything to change the quality levels in its plane, and that capacity is not a concern; the plane used on this route is big enough to hold all travellers.

a. Currently, Little Airlines has 2 sections on its plane: coach, with quality 30, and business class, with quality 60. What prices should it set for a coach ticket and a business class ticket so that tourists buy coach tickets and business travelers buy business class tickets?

b. Demonstrate that the quality levels identified in part a. are not profit-maximizing for Little Airlines.

c. Suppose the fraction of travelers flying this route on business were to increase. What effect, if any, would this have on the optimal price of a coach ticket? Explain.

Problem 3 (15 points) Two Cournot quantity competitors face the following demand curve:

$$P = 9 - q_1 - q_2$$

to keep the problem simple, assume that both firms can produce at zero cost.

a. Solve for the Nash equilibrium. What are q_1 and q_2 in equilibrium, and how much profit does each firm earn?

b. Suppose firm 1 has the option of outsourcing 4.5 units of production at cost $\$K$, and producing nothing on its own (essentially, it is paying $\$K$ to commit to producing 4.5 units). Firm 2 is aware of firm 1's outsourcing decision prior to its determining how much to produce itself. What is the maximum value of K for which outsourcing is a good idea for firm 1? (Hint: compare firm 1's profits with and without outsourcing.)

Problem 4 (10 points) ABC explosives has purchased fire insurance for its factory. It can institute a fire prevention program, which would cost $90, but which would lower the probability of a fire from .01 to .001. The insurance company cannot determine whether ABC has instituted the program. However, it charges a deductible in the event of a fire (i.e. ABC has to pay a certain amount to the insurance company if a fire occurs).

a. What problem discussed in class is the insurance company worried about in charging a deductible?

b. What is the smallest deductible that will incentivize ABC to institute the fire prevention program? (Hint: ABC's expected loss from a fire with no fire prevention program is $.01 * deductible$. Compare this to the expected loss from a fire with the fire prevention program.)

Problem 5 (15 points) Consider the following interaction between two entrepreneurs (players 1 and 2) who are working on a joint project, and a venture capitalist (player 3) who is a potential investor in the project. First, player 1 decides whether to devote high or low effort to preliminary work on the project. Player 2 observes this choice and then decides whether to devote high or low effort himself. They then make a presentation to the venture capitalist, who can observe which, if any, of the entrepreneurs devoted high effort to the project, and decides whether or not to invest.

The payoffs are as follows. Each entrepreneur gets a payment of 5 if the venture capitalist invests and 0 otherwise. In addition, choosing high effort costs an entrepreneur 1, while choosing low effort is free. Investing costs the venture capitalist 2, but if he invests he gains 3 for each entrepreneur who chose high effort. If the venture capitalist does not invest, his payoff is 0. Draw the game tree corresponding to this game and find its equilibrium outcome by solving backwards.

Problem 6 (10 points) A house painter has a regular contract to work for a builder. On these jobs, his cost estimates are generally right: sometimes a little high, sometimes a little low, but correct on average. When his regular work is slack, he bids competitively for other jobs. "Those are different," he says. "They almost always end up costing more than I estimate." If we assume that her estimating skills do not differ between the two types of jobs, what can explain the difference?

Problem 7 (10 points) Consider the following game played between a taxpayer and the IRS:

		IRS	
		Audit	Don't audit
Taxpayer	Cheat on taxes	-50,50	-10,10
	Don't Cheat	-30,20	-30,30

The game has no pure strategy Nash equilibria, but has one mixed strategy Nash equilibrium. Find it.