

Department of Economics
The Ohio State University
Midterm Exam–Econ 805

Prof. Peck
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Directions: *Answer all questions, carefully label all diagrams, and show all work.*

1. (30 points)

Consider the following game with two players, a plaintiff and a defendant engaged in a civil law suit. Nature moves first, selecting which side would win if the case goes to trial. The probability that the plaintiff would win a trial is $\frac{1}{3}$, and the probability that the defendant would win a trial is $\frac{2}{3}$. The plaintiff observes whether or not he would win, but the defendant does not. If the plaintiff wins a trial, his payoff is 3 and the defendant's payoff is -4 . If the plaintiff loses a trial, his payoff is -1 and the defendant's payoff is 0.

Now suppose that the plaintiff, after observing who would win a trial, is forced to propose a settlement, either a low settlement, $m = 1$, or a high settlement, $m = 2$. The defendant, after observing the settlement offer but not nature's move, must either accept the offer or refuse. If a settlement offer of m is accepted, the plaintiff's payoff is m and the defendant's payoff is $-m$. If the settlement offer is not accepted, the case goes to trial.

(a) (15 points) *Give the extensive form representation of this game, by drawing the game tree and labeling things properly. Try to be neat! (If I can't read it, I will not assume that it is right.)*

(b) (15 points) *Find a weak perfect Bayesian equilibrium (WPBE) for this game. Remember to fully specify the strategies and the defendant's beliefs. Explain why the conditions for a WPBE are satisfied.*

2. (40 points)

Rain Forest Nuts (RFN) is a monopolist that gathers nuts from tropical rain forests without damaging trees or interfering with wildlife. Its cost function is given by $c(y) = 4y$, where y is the total production of nuts. Some of RFN's potential customers read the magazine, *Endangered Species Quarterly*, and love to clip coupons. The demand curve from the first class of customers is given by

$$X_1(p, C) = 42 - (p - C),$$

where $X_1(p, C)$ represents the quantity demanded by the first class of customers, $p - C$ represents the actual price paid, p is the posted price, and C is the coupon value to be deducted from the posted price.

The rest of RFN's potential customers do not clip coupons or read magazines. The demand curve from the second class of customers is given by

$$X_2(p) = 32 - \frac{p}{2}.$$

(a) (15 points) If RFN is able to price discriminate by offering coupons in *Endangered Species Quarterly*, what is the profit maximizing posted price, p , and coupon value, C ?

(b) (15 points) If RFN cannot offer coupons or otherwise price discriminate, what posted price and total quantity will maximize its profits?

(c) (10 points) Assuming that the only way to price discriminate is to advertise a coupon in *Endangered Species Quarterly*, what is the most that RFN would be willing to pay for its coupon advertisement?

3. (30 points)

In the following model of Cournot (quantity) competition, the market demand curve is given by

$$X(p) = 100 - 2p.$$

There are two firms. Firm 1 is known to have constant marginal cost of 10. Firm 2 observes its marginal cost before choosing its output, but firm 2's marginal cost is not observed by firm 1. Ex ante, firm 2's marginal cost is 0 with probability $\frac{1}{2}$, and firm 2's marginal cost is a positive constant, h , with probability $\frac{1}{2}$.

(a) (20 points) Assuming that both firms produce a positive quantity, $q_1 > 0$, $q_2^0 > 0$, and $q_2^h > 0$, solve for the Bayesian Nash equilibrium of this game.

(b) (10 points) For what values of h will firm 2 choose not to produce when its marginal cost is h ?