

5 questions, 100 points total. Answer each question in the space provided.

1. You inherit a parking garage in downtown Cincinnati from your rich but now dead uncle. He always charged a flat rate per hour to park in his garage, regardless of length of stay. After observing parking patterns for a couple of months, you determine that there are two distinct types of customers. Short-term parkers (S) have a demand for parking given by $P_S = 3 - (Q_S/200)$, where P is the average hourly rate and Q is the number of parked cars at this price. All-day parkers (A) have a demand for parking given by $P_A = 2 - (Q_A/200)$. The capacity of the garage is 600 cars, and all of your costs are fixed costs, so the marginal cost of parking an additional car in your garage up to capacity is zero.

(15 pts.) What price should you charge for each type of parker? How many will park at the price you charge?

(5 pts.) How would your answer change if your garage only had 400 spaces in it?

(a) $P_S = 3 - Q_S/200$

$$TR_S = P_S Q_S = 3Q_S - Q_S^2/200$$

$$MR_S = \frac{dTR_S}{dQ_S} = 3 - Q_S/100$$

set $MR = MC$, but $MC = 0$, so

$$3 - Q_S/100 = 0, \quad Q_S = 300, \quad \text{and} \quad P_S = \$1.50/\text{hr.}$$

$$P_A = 2 - Q_A/200$$

$$TR_A = 2Q_A - Q_A^2/200$$

$$MR_A = 2 - Q_A/100$$

$$2 - Q_A/100 = 0, \quad Q_A = 200, \quad \text{and} \quad P_A = \$1.00/\text{hr.}$$

(b) if capacity = 400, $Q_A + Q_S = 400$

for profit max. choose Q_A and Q_S such

that $MR_A = MR_S$ subject to $Q_A + Q_S = 400$

$$Q_A = 400 - Q_S$$

$$3 - Q_S/100 = 2 - (400 - Q_S)/100$$

$$3 - Q_S/100 = 2 - 4 + Q_S/100$$

$$5 = 2Q_S/100$$

$$Q_S = 250 \quad P_S = \$1.75$$

$$Q_A = 150 \quad P_A = \$1.25$$

2. (30 pts.) After completing your MBA at UK you go to work for Ticketron in their marketing research department. Your first assignment is to study the demand for tickets to concerts featuring noted country and western star Barf Grooks. Barf is planning another nationwide tour, and he and his agent are curious about the effects of ticket price, city size, and night of the week on attendance at Barf's concerts. You collect data from Barf's previous concert tours, and estimate the following demand equation:

$$\text{Attendance} = 22,000 - 360 \cdot \text{Price} + 175 \cdot \text{Population} + 2425 \cdot \text{Weekend}$$

(4.5) (2.73) (2.2) (3.14)

R-squared for this regression is .45 and the numbers in parentheses are t-statistics. Also, Attendance = number of people purchasing tickets to the concert,

Price = price of a concert ticket in dollars,

Population = population of the surrounding metropolitan area (in 000,000), and

Weekend = 1 if Friday or Saturday, 0 if any other day of the week.

(a) How many tickets would you expect to be sold in Lexington (population = 282,000) for a Friday night concert if ticket prices are \$25?

(b) Calculate own-price elasticity of demand for the above concert at the above ticket price.

(c) If the marginal cost per customer is constant at around \$10, advise Barf and Ticketron on whether they are charging the profit-maximizing price in Lexington.

$$(a) \quad A_{tt} = 22,000 - 360(25) + 175(2.82) + 2425(1) \\ = 9918.5$$

$$(b) \quad \epsilon_{x, p_x} = \frac{\partial Q_x}{\partial P_x} \cdot \frac{P_x}{Q_x} = (-360) \left(\frac{25}{9918.5} \right) = -1.51$$

$$(c) \quad \text{Optimal markup rule: } \frac{P - MC}{P} = -\frac{1}{\epsilon_{x, p_x}}$$

$$\frac{25 - 10}{25} \stackrel{?}{=} \frac{1}{1.51}$$

$$.6 \stackrel{?}{=} .66$$

close!

$$\text{optimal price: } P = \left(\frac{\epsilon}{1 + \epsilon} \right) MC$$

$$\approx \frac{-1.5}{1 - 1.5} \cdot MC$$

$$\approx 3.10 \approx \$30$$

3. (10 pts.) Briefly explain the three different types of price discrimination and give an example of each.

- ① 1st degree - perfect price discrimination,
extracts all consumer's surplus.
ex. car dealer bargains with each customer
- ② 2nd degree - customers self-select according
to the price schedule offered by the seller.
ex. declining block prices, quantity discounts
- ③ 3rd degree - different prices are charged
to different market segments.
ex. airline ticket pricing

4. (20 pts.) A question about studying for ECO 610 exams:

Output = exam score on a scale of 0 to 100

Inputs: Hours = hours spent studying for the exam
 Classes = classes attended prior to the exam
 GPA = undergraduate grade point average
 GMAT = score on the GMAT exam

The hypothesized functional form of the production technology is Cobb-Douglas:

$$Q = A \cdot \text{Hours}^\beta \cdot \text{Classes}^\gamma \cdot \text{GPA}^\delta \cdot \text{GMAT}^\epsilon$$

Parameter estimates from regression analysis:

$$\ln A = -.8972, \text{ so } A = e^{-.8972} = .4077$$

$$\beta = .0614$$

$$\gamma = .3971$$

$$\delta = .2095$$

$$\epsilon = .6668$$

(a) Suppose you studied five hours for the exam, attended four classes prior to the exam, your undergraduate GPA was 3.2, and your GMAT score was 600. What is your expected score on the exam?

(b) Derive an expression for the marginal product of hours spent studying for the exam.
 (c) How much would an additional hour spent studying increase your expected score?
 (d) How much would attending an additional class increase your expected score?

$$(a) \quad Q = (.4077)(5)^{.0614}(4)^{.3971}(3.2)^{.2095}(600)^{.6668}$$

$$Q = (.4077)(1.104)(1.734)(1.276)(71.199)$$

$$Q = 70.9$$

$$(b) \quad MP_H = \frac{\partial Q}{\partial H} = \beta \cdot A \cdot \text{Hours}^{\beta-1} \cdot \text{Classes}^\gamma \cdot \text{GPA}^\delta \cdot \text{GMAT}^\epsilon$$

$$(c) \quad MP_H = (.0614)(.4077)(.2207)(1.734)(1.276)(71.199)$$

$$MP_H = .87$$

$$(d) \quad MP_C = \frac{\partial Q}{\partial C} = \gamma \cdot A \cdot \text{Hours}^\beta \cdot \text{Classes}^{\gamma-1} \cdot \text{GPA}^\delta \cdot \text{GMAT}^\epsilon$$

$$MP_C = (.3971)(.4077)(1.104)(.4335)(1.276)(71.199)$$

$$MP_C = 7.04$$

5. (20 pts.) After he notices the other truckers snickering behind his back at a recent reunion of ATA Academy alumni, Burton Denson hires you to analyze the economic profitability of his independent trucking business. His accounting education stopped with basic bookkeeping, and he never had a course in managerial accounting. He is concerned that the other truckers who are driving for big trucking companies are doing better than he is. Burton owns his own rig, for which he paid \$360,000. He hauls truckload cargo, meaning that he fills his truck with one shipper's cargo and hauls it from point to point. He charges \$2 per mile, which is the market-determined price. In a typical month he can log 13,000 miles. He has fuel expenses of \$10,000 per month, maintenance expenses of \$6,500 per month, and taxes of \$1,500 per month. Burton's fellow alumni earn monthly wages of \$5,000 on average driving for big trucking companies. Burton figures that his tractor-trailer rig will decline in market value to \$330,000 by the end of the year. Burton can borrow and lend at 5%. Calculate Burton's economic profits, carefully explaining how you arrive at your answer. What advice would you then give Burton?

$$\text{Revenue} = 13,000 \text{ miles} @ \$2/\text{mile} = \$26,000 \text{ per month}$$

Explicit Costs:	Fuel	\$10,000
	Maintenance	6,500
	Taxes	1,500
		<hr/>
		\$18,000

Implicit Costs:

① Interest earnings foregone on equity in truck: \$360,000 @ 5% = \$18,000/yr or \$1,500.00 per month

② Opportunity cost of Burton's time, he could have earned \$5,000 working elsewhere

③ Depreciation - his truck has a market value of \$360,000 at beginning of year and \$330,000 at end of year. Economic depreciation of the asset is \$30,000 for the year or \$2,500 per month.

$$\text{Total Costs} = \$18,000 + \$1,500 + \$5,000 + \$2,500 = \$27,000$$

So Burton's economic profits are - \$1,000 per month.

He should sell the business and go to work for someone else.