

# KANSAS STATE UNIVERSITY

## ECONOMICS FOR BUSINESS

Examination 1  
Spring 2001

Economics 815  
Professor D. Weisman

**I. Short Answer (40 points).** Answer 4 (and only 4) of the following 6 questions.

1. A firm's demand curve is given by  $Q = 20 - 2P$ . What price would this firm charge to maximize revenue? What is the price elasticity of demand at this price?
2. A firm's production function is given by  $Q = 2KL$ , where  $K$  is capital and  $L$  is labor. Suppose that  $w = 2$  and  $r = 4$ . How much  $K$  and  $L$  would the firm optimally employ to produce 64 units of output? What is the total cost of producing this level of output?
3. The production function for your grade on this examination is given by  $G = 20 + 2A^{0.5}E^{0.5}$ , where  $G$  is your numerical score,  $A$  is your ability level, and  $E$  is your effort level measured in terms of hours studied. If your ability level is 100, how many hours would you have to study in order to receive a grade of 90 on this examination? Does this production function reflect increasing, decreasing, or constant returns to scale? Provide a brief explanation for your answer.
4. The airlines have estimated that the average price of an airline ticket would rise by \$40 if the government mandated child safety seats on airplanes. The government believes this policy would reduce fatalities on airplanes by 400 per year. The demand function for automobile travel is  $Q^M = 200 - P^G + I + 1.25P^A$ , where  $Q^M$  is quantity of miles driven per year (in units of 100,000 miles),  $P^G$  is the price per gallon of gasoline,  $I$  is per-capita income (in thousands of dollars) and  $P^A$  is the average price of an airline ticket (in dollars). The government estimates that there are 10 automobile fatalities for each 100,000 miles driven. Determine whether mandating child safety seats on airplanes will save lives? Provide the economic rationale for your answer.
5. Let the demand for Marijuana be given by  $Q^M = 100 - 2P^M - 1P^C$ , where  $Q^M$  and  $P^M$  are the quantity and price of Marijuana (in dollars), respectively and  $P^C$  is the price of Cocaine (in dollars). Let the supply of Marijuana be given by  $Q^M = 2P^M - 1J$ , where  $J$  represents the recommended jail time (in years) if convicted of distributing Marijuana. Let  $P^C = 20$ . Derive an expression for the equilibrium price of Marijuana. What is the effect of a 1 unit increase in  $J$  on the price of Marijuana in equilibrium? Provide an economic interpretation for this result.
6. Suppose that the market demand function is linear of the form  $Q = a - bP$ , where  $Q$  is quantity demanded and  $P$  is price. Two points on this demand curve are  $Q_1 = 20$ ,  $P_1 = 4$  and

$Q_2 = 12$ ,  $P_2 = 6$ . What is the equation of the linear demand curve through these two points? What is consumers' surplus at a price of 6?

**II. Problems (60 points).** Answer 2 (and only 2) of the following 3 questions.

1. The demand for rental housing in Manhattan is given by  $Q^D = 32 - 2P + q$ , where  $Q^D$  is the quantity of rental housing,  $P$  is the average price of rental housing and  $q$  is a measure of housing quality. The supply of rental housing is given by  $Q^S = P - C$ , where  $C$  represents the average expenditure per rental housing unit to comply with building codes.
  - a) Suppose that  $C$  is initially 0 and that  $q = 4$ . Determine the equilibrium price and quantity of rental housing. What is consumers' surplus at the market equilibrium?
  - b) Suppose now that the City of Manhattan passes a resolution adopting more stringent rental housing codes. This resolution results in  $C$  rising from 0 to 4. [The basic idea is that more stringent building codes will lead to enhanced quality of rental housing.] What is the new equilibrium price and quantity in the rental housing market for any value of  $q$ ?
  - c) For what values of  $q$  will consumers be no worse off from the city passing this new resolution. Provide the economic rationale for your answer.
2. As discussed in class, government regulators in California have capped the retail price of electric power. Suppose that the demand function for electric power is given by  $Q^D = 40 - 2P + r$ , and the supply function for electric power is given by  $Q^S = 1P$ , where  $P$  is the price per kilowatt hour,  $Q$  is quantity of kilowatts and  $r$  is an aggregate index of power reliability. Suppose that regulators set the price cap at  $P^{\max} = 12$ .
  - a) Let  $r = 20$  both before and after the imposition of the price cap. Are consumers of electric power better off with the price cap or the free market price? Provide a careful economic analysis in support of your claim.
  - b) Suppose that California regulators believe that they must impose minimum reliability standards (i.e., reliability floors) on the electric power companies along with the price cap. Continue to assume that  $r = 20$  prior to the imposition of the price cap. At what level would regulators have to set the reliability floor,  $\underline{r}$ , in order for consumers to be no worse-off from the price cap policy? Provide a careful economic analysis in support of your claim.
  - c) Is there excess demand for electric power at the price cap of  $P^{\max} = 12$  and the reliability floor you derived in part b)? If so, determine the amount of this excess demand.
3. A firm must make an upfront (sunk) investment in a technology in time period 1 in order to produce output in time period 2. The firm has two choices: Technology A or Technology B. Technology A requires an upfront investment of  $I^A = \$400$  and enables the firm to produce in time period 2 with the production function  $Q = \min\{2K, L\}$ . Technology B requires an upfront investment of  $I^B = \$800$  and enables the firm to produce in time period 2 with the

production function  $Q = 2K + 1L$ . The input prices expected to prevail in time period 2 are  $w = 2$  and  $r = 4$ . [Note: You should assume that there are only two time periods in this model and ignore any issues associated with discounting across time periods.]

- a) Derive the cost function associated with each technology choice that the firm would face in time period 2.
- b) What can you infer about the firm's forecast of output in time period 2 if it chooses Technology B?
- c) Suppose that actual demand in time period 2 is 100 units. What is the cost of this forecasting error to the firm given it chose to produce with technology B?