

Homework 2

due Monday, September 26 by 1pm

Problem 1 Suppose that most people will not speed if the expected fine is greater than \$200. Given current police practices, the probability of being caught speeding is 20%.

- a. How high must the actual fine for speeding (what you have to pay if you get a ticket) be to deter most people from speeding?
- b. Suppose the Lexington mayor caps the amount police can fine speeding motorists at \$500. The police vow to step up enforcement in order to continue to deter speeding. How high must the probability of being caught speeding be in order to deter most people from speeding?

Problem 2 Answer the following questions about expected utility and risk aversion:

- a. True/false/uncertain: Rex, who is risk averse, prefers a salaried job that will pay him \$100,000 with certainty to a commission-based job that will pay him \$20,000 with probability .5 and \$200,000 with probability .5. (Explain why you think it is true, false, or uncertain.)
- b. Kyle is an English PhD student; there is some chance he will get a prestigious university job that will pay him \$80,000/year (probability p). If he does not get this job, he will have to take a job at Starbucks, paying \$25,000/year (probability $(1 - p)$). Kyle's utility function over salary is given by \sqrt{w} , where w is the amount of his salary. Before Kyle has a chance to finish his PhD, he is offered a job at Dunder Mifflin paying \$60,000/year. How low does p have to be before Kyle is better off taking the Dunder Mifflin job? (hint: p is some number between 0 and 1. For example, $p = .25$ means there is a 25% chance of Kyle getting the university job and a 75% chance of his working at Starbucks.)

Problem 3 A driver faces a 5% probability that his car will be in an accident and will be worth nothing. Consider three drivers with cars that have value \$30,000. Abdulla's utility function over the value of his car W is $u(W) = \ln(1 + W)$. Bedriya's utility function is $u(W) = 100 + 0.5W$.

- a. What is Abdulla's risk premium?
- b. What is Bedriya's risk premium?
- d. Which of these two people is less likely to take on risk? Which is more likely? How do you know?

Problem 4 Answer the following two questions about insurance markets:

- a. Give a concrete example of adverse selection occurring in an insurance market. Explain how your example could lower the profit of an insurer, and what steps might be taken to mitigate the problem.
- b. Give a concrete example of moral hazard in an insurance market. Explain how your example could lower the profit of an insurer, and what steps might be taken to mitigate the problem.

Problem 5 The production function for a firm's product is given by $q = f(K, L) = 5 * K * L$. The price of capital is \$10 and the price of labor is \$15.

- a. Suppose the firm wishes to produce output of 500. List 5 combinations of capital and labor that the firm can transform into 500 output.

- b.** For each of your 5 combinations from part a, give the cost of using that combination of capital and labor. Which is the lowest?
- c.** For your lowest cost combination from part b, calculate the marginal product of capital (MPK) and the marginal product of labor (MPL).
- d.** For your answer in parts b-c, is your marginal product per dollar equal across the two inputs? If not, should the firm use more labor-intensive production or more capital-intensive production?

Problem 6 A firm has production function $f(K, L) = \sqrt{KL}$. In the short run, the firm has capital $K = 400$; this cannot be changed in the near future. The cost of a unit of capital is \$20, while the cost of a unit of labor is \$30.

- a.** In the short-run, how much labor does the firm need to employ in order to produce $q = 300$ output? What is the cost of producing 300 output?
- b.** Repeat part a for $q = 400$, $q = 500$ and $q = 600$.
- c.** What is the cost of producing q output in the short-run?
- d.** What is the marginal cost of producing a 301st unit? A 401st unit? If you are comfortable doing so, you may answer this question by writing down the marginal cost function directly, rather than recalculating total cost for $q = 301$ and $q = 401$.
- e.** Given your answer to part c, draw a graph with the firm's average total cost, average variable cost, and marginal cost (hint: $MC = \frac{3}{20}q$).
- f.** Suppose the firm operates in a competitive market, and the price of the output good is $p = \$15$. How much output will the firm supply. What will the firm's profit be at this price?
- g.** Now suppose that the competitive price changes, to $\$p$. How much output will the firm supply, as a function of p ? What is the minimum price that the firm needs in order to be profitable in the short-run? In the long-run?
- h.** Finally, suppose now the firm's marginal cost is still $MC = \frac{3}{20}q$, but the firm is a monopoly with demand curve equal to $p = 24 - \frac{3}{40}q$. Solve for the firm's profit-maximizing price and quantity. What is the monopolist's profit?

Problem 7 Magee's Bakery, in downtown Lexington, estimates that its demand for transparent pies has a price elasticity of -1.5 .

- a.** Suppose Magee's were to increase its price. In which direction would each of the following move: revenue, total costs, profit? For each, answer "increase", "decrease", or "uncertain", along with a brief explanation.
- b.** Suppose Magee's were to decrease its price. In which direction would each of the following move: revenue, total costs, profit? For each, answer "increase", "decrease", or "uncertain", along with a brief explanation.
- c.** Finally, suppose for part c only that you now have the additional information that the marginal cost to Magee's of making one transparent pie is \$2 (and is constant). Magee's currently charges \$5 for each transparent pie. Should they increase or decrease this price, or should they leave it at \$5?