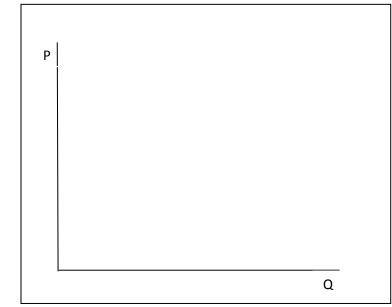Your Name: _____ UM uniquename _____

Ford School of Public Policy 555: Microeconomics A
Fall 2011
Placement Exam
Professor Kevin Stange

This exam has 8 questions and spans the topics we expect to cover in the course. Please explain your answers when asked and show your work. You have two hours to complete the exam. Good luck.

1. New York City is considering implementing a $1.00 congestion tax on each car that commutes into Manhattan. Currently, 100,000 cars commute into Manhattan each day. Given this information, the City Finance Department projects that the city will take in $100,000 of revenue each day from this tax. Do you agree with this analysis? Why or why not?

2. Cora only consumes two goods: formula and avocados. Given her current level of consumption of these two goods, her marginal utility for formula is 5 and her marginal utility for avocados is 10. The price of formula is $4.00 and price of avocados is $1.00. Is Cora consuming the optimal amount of each good? If no, then how, in words and not math, should we adjust her consumption to reach optimality? Assume that Cora has diminishing marginal utility for all goods.

3. This question asks you to examine the effects of the minimum wage (a price floor) on the market for low wage workers. Suppose the labor supply of workers is $Q_S = 20+P$ and the labor demand for workers is given by $Q_D = 50-2P$. P is the "price" paid for labor services (also known as the wage) and Q_S and Q_D are supply and demand for labor services respectively (measured in total number of workers). For simplicity, assume that all workers have the same skills, so are paid the same wage.

    a. Draw the supply and demand curves in the space below. Label all intercepts and slopes. Be sure to indicate which line is the supply curve and which line is the demand curve. Your graph does not need to be to scale.

P

Q

    b. What is the equilibrium price and quantity? Label these P* and Q* on your graph.

    c. At this equilibrium price and quantity level, calculate the price elasticity of demand and of supply. Which is more price elastic, supply or demand? Describe what the elasticity of demand means (in words).

    d. Label producer and consumer surplus on the graph.

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e. In an attempt to increase the income of low-wage workers, suppose the government implements a minimum wage that stipulates all workers must be paid at least $12. How many workers are employed in the market now and what is the wage? Label this new point P^{mw} and Q^{mw}.

f. Relative to the completely unregulated situation (parts a – d), describe *qualitatively* the "consumer" and "producer" welfare (surplus) effects from this policy. You can use graphs if that would help you explain your answer, but a precise written answer is fine too. Remember that in this case the "consumers" are the purchases of labor services (i.e. employers) and the "producers" are the suppliers of labor services (i.e. low wage workers).

4. True or False: "The income effect associated with a price increase of a good will cause consumption of that good to always decrease." Briefly explain your answer.

5. True or False: "The substitution effect associated with a price increase of a good will cause consumption of that good to always decrease." Briefly explain your answer.

6. Consumer choice. [Note: all dollar amounts are in millions, but you can ignore that] You are the mayor of a small town that has a fixed budget of $9 each year (you are not able to raise revenue). The residents of your town have a collective utility function over schools (denoted by S) and all other services such as roads, parks, etc (denoted by X). The town's utility function is described by $U(S,X) = 5S^2X$. The price of schools $P_S = 2$ and the price of all other goods is normalized to $P_X = 1$. The town spends its entire budget on schools and all other goods.

   a. Calculate the town's optimal ratio between S and X

   b. Given the town's budget constraint, what is its utility-maximizing number of schools S and units of all other services X?

   c. Suppose the U.S. Department of Education is providing grants to communities in order to get them to build more schools. By how much would the grant have to lower the effective price of schools in order for the town to want to double its number of schools? Show your work.

d.   Show your answers to b and c graphically on a single diagram with X on the horizontal axis and S on the vertical axis. Include in your diagram the (1) original budget constraint (BC$_0$), (2) the original indifference curve (IC$_0$), (3) the original optimal market basket (A), (4) the new budget constraint with the new (subsidized) school price (BC$_1$), (5) the new indifference curve(IC$_1$), and (6) the new optimal market basket (B). Label all slopes and intercepts.

7.   Input choice. You are the director of large urban hospital. Your hospital produces health services (Q) using two inputs: capital (buildings, machines, etc denoted by K) and labor (nurses, physicians, clerical staff, etc denoted by L) according to a production function:
$$Q = 10(K)^{1/2}(L)^{1/2}$$
Initially the price of capital is P$_k$ = $20 per unit and the price of labor is P$_L$ = $5.

a.   Are hospital services produced with increasing, constant, or decreasing returns to scale? Briefly explain what this means.

b.   What are the marginal products of capital and of labor?

c. Suppose all inputs are variable so you are free to choose any combination of capital and labor you see fit. What is the cost-minimizing ratio between capital (K) and labor (L)?

d. You estimate that your community will need 1000 health services each year. How many units of capital and labor will your hospital need to reach this target and spend the least amount of money?

e. How much money will your hospital need to spend annually to reach this goal?

8. Imperfect markets. In the mid-1990s five companies, including American company Archer Daniels Midland, were discovered to have colluded to fix prices in the market for an animal feed additive called lysine (as popularized in the Matt Damon movie *The Informant*). First assume that the group of companies acts as a single monopolist in the market for lysine. The aggregate demand function is given by

$$Q = 100\text{-}2P$$

where Q is the quantity demanded and P is the price. The group's total cost function is given by

$$TC = 100 + 10Q + 2Q^2.$$

    a. What is the marginal revenue function?

    b. What is the marginal cost function?

    c. If the group acted as a single monopolist to maximize profits, what price will the companies charge and how many units of Q will it sell?

    d. What would price and quantity be if the companies instead acted to maximize total surplus? (Note: you would need a calculator to actually compute this. If you do not have one, you can just show it in fractions).