

SUID:

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Exam 2
Fall 2019

DO NOT OPEN THIS EXAM UNTIL YOU ARE TOLD TO DO SO.

Instructions

1. Write your SUID in the upper right corner of this exam. **DO NOT** write your name.
2. **SHOW ALL YOUR WORK.** Answers without supporting work will receive little or no credit.
3. There are 80 points possible on the exam and you'll have 80 minutes to work on it. Budget your time accordingly.
4. Do all your work on this exam. If you need extra space, write on the backs of the pages. However, if you do write an answer on the back of a page, be sure you've **NOTED THAT NEAR THE QUESTION.**
5. Some formulas for areas:

$$A = \frac{1}{2}bh \quad A = \left(\frac{b_1 + b_2}{2}\right)h$$

6. Some algebraic relationships for exponents:

$$(AB)^c = A^c B^c \quad A^c A^d = A^{c+d} \quad \frac{1}{\left(\frac{A}{B}\right)^c} = \left(\frac{B}{A}\right)^c \quad (A^c)^d = A^{cd}$$

7. The general form of the Cobb-Douglas utility function, its demand equations, and its expenditure function:

$$U = X^b Y^{1-b} \quad X = \frac{bM}{P_x} \quad Y = \frac{(1-b)M}{P_y} \quad M = U * \left(\frac{P_x}{b}\right)^b \left(\frac{P_y}{1-b}\right)^{1-b}$$

Question 1 (15 points)

A nonprofit organization offers dental care to two kinds of patients, G and B. G patients generally have good teeth and providing care to them is inexpensive. B patients have bad teeth and are much more expensive. However, the organization is committed to charging all patients the same price. Information about the two groups is provided in the table below.

Variable	G	B
Number of patients	20,000	5,000
Demand elasticity	-1	-1
Cost per patient (WTA)	\$100	TBD

The organization set its price at \$200 a few years ago and used to break even. However, a big technological advance has lowered the cost of treating B patients (there was no change for G patients). The organization is now earning \$1 million in overall net revenue and it is considering lowering its price to \$160.

- (a) Please determine: the organization's total extra revenue from G patients at the current \$200 price; the organization's current cost (WTA_B) of treating a B patient; the number of patients of each type it would have if it lowered the price to \$160; and the new overall surplus or deficit resulting from the revised policy.

Question 2 (15 points)

Ridesharing companies, most notoriously Uber, raise prices via “surge pricing” when demand is especially high. Some people regard that as price gouging and say a ceiling should be imposed on the price of a ride. This question explores the issue.

Suppose that the market WTA curve for rides is given by $WTA = 0.02Q$. Under normal conditions, the market WTP curve is given by $WTP = 100 - 0.08Q$. However, during peak periods, like New Year’s Eve, the WTP curve jumps to $WTP = 200 - 0.08Q$ while the WTA curve remains unchanged (i.e., it is the same in both normal and peak periods). The government is considering imposing a rule that would require rideshare companies to charge the same price during peak periods that they charge during normal periods.

- (a) Please determine: the equilibrium P and Q during normal periods; the equilibrium P and Q during peak periods when surge pricing is allowed; the Q that would occur during peak periods if the price control were imposed; and the changes in peak-period CS and PS that would result from the control. Briefly discuss who gains and loses if the ceiling is imposed.

Question 3 (5 points)

A household has the utility function and demand equations shown below. Please derive its expenditure function. Be sure to show the steps, not just the final result. Then calculate the amount of income the household would need to get a utility of 240 when $P_x = 9$ and $P_y = 16$.

$U = (X)^{0.5}(Y + 100)^{0.5}$	$X = \frac{0.5M + 50P_y}{P_x}$	$Y = -100 + \frac{0.5M + 50P_y}{P_y}$
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Question 4 (15 points)

One of the households in the table to the right has Cobb-Douglas preferences. In the remainder of the exam, this will be referred to as the CD household.

Year	Px	Py	HH	Income	X	Y
2018	4	8	A	3600	350	275
			B	1600	200	100
			C	3600	540	180
			D	4200	700	175
2019	6	2	A	4100	325	1075
			B	2800	400	200
			C	4000	400	800
			D	4200	175	1575

- (a) Please: determine which one is the CD household and calculate its value of b ; draw a diagram illustrating the CD household's 2019 equilibrium. Please note that information about the key functions associated with CD preferences is given on the cover of the exam.

Question 4, continued

Year	P _x	P _y	HH	Income	X	Y
2019	6	2	A	4100	325	1075
			B	2800	400	200
			C	4000	400	800
			D	4200	175	1575

Now suppose that in 2019 the government wants to shift consumption away from good Y and toward good X. To do so, it plans to impose a \$2 subsidy on X and a \$2 tax on Y. It also plans to impose a \$380 lump sum income tax on the household to help make the policy come close to breaking even overall. You may assume the supplies of X and Y are perfectly elastic so P_x would fall to \$4 and P_y would rise to \$4. For convenience, the data for 2019 are repeated above.

- (b) Please calculate: the new values of X and Y under the policy; briefly comment on the extent to which the policy changes X and Y; the overall effect on the government's budget, and indicate whether the policy achieves the government's revenue goal; the CV, and indicate whether the household is better or worse off; and the net impact of the policy on social surplus.

Question 5 (15 points)

A household buys two goods, X and Y, and its preferences can be represented by the utility function shown below. Also shown are the household's demand equations and its expenditure function.

$U = (X^{0.5} + Y^{0.5})^2$	$X = \frac{M * P_y}{P_x(P_x + P_y)}$	$Y = \frac{M * P_x}{P_y(P_x + P_y)}$	$M = U * \left(\frac{P_x * P_y}{P_x + P_y} \right)$
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Initially, $P_x = \$8$, $P_y = \$12$, and $M = \$3,360$. The government is considering a policy that would impose a \$4 tax on X. The supply of X is perfectly elastic and its price would rise to $P_x = \$12$.

- (a) Please calculate: the initial equilibrium before the policy is enacted (both X and Y); the new value of X with the policy in place (it's OK to skip the new value of Y); the total government revenue raised by the tax; the CV for the policy; and the policy's income and substitution effects for the X good.

Question 6 (15 points)

An individual is making decisions about training and consumption in two periods. In period 0 her income is \$60,000, and in period 1 it will rise to \$72,000. However, she also has an opportunity to enroll in either of the two training programs in the table below (one program at most). She would like to have 1.5 units of consumption in period 0 for every unit of consumption in period 1. She can borrow or save at an interest rate of 20%.

Program	Tuition in 0	Raise in 1
A	\$20,000	\$30,000
B	\$37,000	\$48,000

- (a) Please determine: which training program, if any, she should take; how much she consumes in each period; and the amount she borrows or saves in period 0. Finally: illustrate your results with an appropriate diagram showing her intertemporal budget constraint after she decides whether or not to take the training program, an indifference curve, and her equilibrium.

Additional page for calculations

If you use this, please remember to indicate near the question that part of the answer is here.