SUID:

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Exam 2
Fall 2022

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 this exam and you will have 80 minutes to complete it. Be sure to budget your time accordingly.

4. You may write on the backs of pages, on the extra page at the end, or on extra sheets of paper but **BE SURE TO NOTE THAT NEAR THE QUESTION**.

5. If you use extra sheets of paper, please number them so you can do step 4 above.

6. Some formulas for areas:

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

7. Some algebraic relationships for exponents:

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

8. Some functions relevant for Cobb-Douglas preferences:

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

Question 1 (15 points)

Suppose a non-profit organization provides medical services to older clients in two markets, L and H. Market L has clients with low needs that are inexpensive to serve, and market H has clients with high needs and much higher costs. The organization is committed to charging all clients the same price. It current charges $100, and additional data on the individual markets is provided below. The organization is currently running a deficit of $200,000 and is considering raising its price to $120 in the hope of eliminating the deficit.

Variable	**Market L**	**Market H**
Clients	10,000	2,000
WTA in dollars per unit	$80	TBD
Demand elasticity	-0.5	-0.25

(a) Please determine: ☐ the amount of extra revenue the organization is earning from the L clients; ☐ the organization's WTA for H clients; ☐ the new number of clients in each market if the price were raised to $120; ☐ the organization's new deficit or surplus, and indicate whether the change solves the deficit; and ☐ the change in CS in each of the markets.

Question 2 (15 points)

Scotland recently introduced a price floor on alcohol in an attempt to reduce drunk driving accidents. For a typical bottle of wine, the floor would be about $5 in the US. This question examines how that would have affected buyers of "Two-Buck Chuck", a famously inexpensive wine from the Charles Shaw winery that sold for $2 a bottle. At its peak, Trader Joe's, a trendy US grocery store, sold about 80 million bottles of it a year.

Suppose a $5 price floor had been imposed during the era of Two-Buck Chuck (TBC). As noted above, without the floor TBC was selling for $2 per bottle and 80 million bottles a year were being sold. Also, suppose the elasticity of demand for TBC was known to be -0.4 and the elasticity of supply was known to be 1.2.

(a) Please determine: ☐ the new quantity of TBC under the price control; ☐ the change in CS and PS resulting from the policy; and ☐ the DWL it would create. Briefly discuss who gains and who loses from the policy. *Extra credit: what tax rate on TBC, in dollars per bottle, would produce the same change in the quantity?*

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.

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

Year	Px	Py	HH	Income	X	Y
2021	8	10	A	3500	375	50
			B	2600	130	156
			C	2562	244	61
			D	2100	145	94
2022	9	12	A	3810	370	40
			B	2700	120	135
			C	3264	272	68
			D	2400	152	86

Question 4 (15 points)

One of the households in the table to the right has Cobb-Douglas preferences. In the remainder of Question 4, it will be referred to as the CD household.

(a) Please: ☐ determine which one is the CD household and calculate its value of *b*; then ☐ draw a diagram illustrating the household's 2022 equilibrium. Please note that information about the key functions associated with Cobb-Douglas preferences is given on the cover of the exam.

Year	Px	Py	HH	Income	X	Y
2022	9	12	A	3810	370	40
			B	2700	120	135
			C	3264	272	68
			D	2400	152	86

Question 4, continued

Now suppose that in 2022 the government decides to impose a \$1 tax on X and a \$2 subsidy on Y. In addition, it imposes a lump sum tax on the household of \$200 dollars to help make the policy break even. For convenience, the data for 2022 are repeated above. You may assume the supplies of X and Y are perfectly elastic so P_x would rise to \$10 and P_y would fall to \$10.

(b) Please calculate: ☐ the new values of X and Y under the policy; ☐ the overall effect of the policy on the government's budget and ☐ indicate whether or not the policy succeeds in breaking even; ☐ 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 below. Also shown are the household's demand equations and its expenditure function.

$U = (X-20)^{0.5}(Y+20)^{0.5}$	$X = 10 + \frac{0.5M + 10P_y}{P_x}$	$Y = -10 + \frac{0.5M - 10P_x}{P_y}$	$M = 20(P_x - P_y) + 2U(P_x)^{0.5}(P_y)^{0.5}$

Initially, $P_x = \$25$, $P_y = \$25$, and M = \$40,000. The government is considering a policy that would impose a \$5 tax on X. The supply of X is perfectly elastic and its price would rise to $P_x = \$30$.

(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 CV for the policy; and ☐ the policy's income and substitution effects for the X good.

Question 6 (15 points)

An individual is concerned about consumption in two periods: 0 and 1. In period 0 her income is $60,000, and in period 1 it will rise to $120,000. However, she also has an opportunity to enroll in training program A or B in the table below (one program at most). She can borrow or save at an interest rate of 20% and she wants to have exactly 2 units of consumption in period 1 for each unit of consumption in period 0.

Program	Tuition in 0	Raise in 1
A	$16,000	$48,000
B	$18,000	$60,000

(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 a 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.