SUID:

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Exam 2
Fall 2017

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 75 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:

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

6. Some algebraic relationships for exponents:

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

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

$$U = X^g Y^{1-g} \qquad X = \frac{gM}{P_x} \qquad Y = \frac{(1-g)M}{P_y}$$

Question 1 (15 points)

In the aftermath of a severe hurricane, a government is concerned about a sharp rise in the price of plywood (used for building construction and repairs) and it is considering imposing a price control. The government believes that in the absence of a price control, the price of plywood would be $30 per sheet and 2 million sheets would be demanded. It also believes the elasticity of demand for plywood is -0.2 and the elasticity of supply is 0.6. It is considering imposing a price control at the price prior to the hurricane, which was $25.

(a) Please determine: ☐ the amount of plywood that would be sold if the price control goes into effect; ☐ the changes in CS and PS that would be caused by the policy; and ☐ the DWL it would create.

Question 2 (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.

HH	Year	Income	Px	Py	X	Y
A	2016	6000	12	12	250	250
	2017	7920	18	15	200	288
B	2016	1200	12	12	30	70
	2017	1800	18	15	30	84
C	2016	4500	12	12	225	150
	2017	4788	18	15	171	114

(a) Please: ☐ determine which one is the CD household and calculate its value of g; ☐ draw a diagram illustrating the CD household's 2017 equilibrium; and then ☐ *derive* the expenditure function for the CD household. Be sure to show all the steps, not just the final result.

HH	Year	Income	Px	Py	X	Y
A	2017	7920	18	15	200	288
B	2017	1800	18	15	30	84
C	2017	4788	18	15	171	114

Question 2, continued

Now suppose that in 2017 the government wants to give an income tax cut worth $280 to the CD household. Please treat the tax cut as a $280 lump sum payment to the household. To make up the revenue, it wants to impose a $6 tax on X and $1 tax on Y. You may assume the supplies of X and Y are perfectly elastic so Px would rise to $24 and Py would rise to $16. For convenience, the data for 2017 are repeated above.

(b) Please calculate: ☐ the new values of X and Y under the policy; ☐ the overall effect on the government's budget, and indicate whether the policy breaks even; ☐ the CV, and indicate whether the household is better or worse off; and ☐ the net impact of the policy on social surplus.

HH	Year	Income	Px	Py	X	Y
A	2016	6000	12	12	250	250
	2017	7920	18	15	200	288
B	2016	1200	12	12	30	70
	2017	1800	18	15	30	84
C	2016	4500	12	12	225	150
	2017	4788	18	15	171	114

Question 3 (15 points)

One of the households in the table to the right regards X and Y as perfect complements and always buys *d* units of good X for each unit of good Y. In the remainder of the exam, this will be referred to as the PC household.

(a) Please: ☐ *derive* the PC household's demand equations for X and Y in terms of *d,* Px, Py and income M (be sure to show the steps involved, don't just write down the demand equations); and ☐ determine which one of the households in the table has perfect complements preferences and calculate the value of *d*.

HH	Year	Income	Px	Py	X	Y
A	2017	7920	18	15	200	288
B	2017	1800	18	15	30	84
C	2017	4788	18	15	171	114

Question 3, continued

Now suppose that in 2017 government imposes a slight variation on the policy from Question 2: a $6 tax on X and $1 tax on Y (both the same as before), but the PC household receives an income tax cut of $412 (again, treated as a lump sum payment).

(b) Please compute: ☐ the PC household's new equilibrium; ☐ the overall effect on the government's budget; ☐ the CV; and ☐ the change in SS. Finally, show the new equilibrium in a well-labeled diagram.

Question 4 (15 points)

A household buys two goods, X and Y, and its preferences can be represented by the utility function shown below (a form known as Stone-Geary, which is an extension of Cobb-Douglas). Also shown are the household's demand equations and its expenditure function.

$U = (X - 200)^{0.5}(Y + 100)^{0.5}$	$M = 200 * P_x - 100 * P_y + 2U(P_x)^{0.5}\left(P_y\right)^{0.5}$
$X = 200 + 0.5 * \frac{\left(M - 200P_x + 100P_y\right)}{P_x}$	$Y = -100 + 0.5 * \frac{\left(M - 200P_x + 100P_y\right)}{P_y}$

Initially, $P_x = \$20$, $P_y = \$10$, and M = \$20,000. The government is considering a policy that would place a \$5 tax on X. The supply of X is perfectly elastic and its price would rise to $P_x = \$25$.

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

Question 5 (15 points)

An individual is concerned about consumption in two periods: 0 and 1. In period 0 she is working and her income is $120,000, and in period 1 she will be retired and her income will drop to $40,000. Her preferences over bundles of consumption in the two periods, C0 and C1, are given by a Cobb-Douglas utility function of the form $U = C_0^{0.6} C_1^{0.4}$. She can borrow or save at an interest rate of 10%.

(a) Please determine: ☐ 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, 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.