SUID:

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Exam 2
Spring 2018

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:

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

Question 1 (15 points)

A government is considering imposing a minimum wage. There is no minimum wage in place now and the market is in equilibrium with a wage of $10 and 1 million workers employed. The elasticity of demand for labor is known to be -0.25 and the elasticity of labor supply is known to be 0.5. The government would like to impose the highest minimum wage it can without having more than 5% of workers lose their jobs.

(a)   Please determine: □ the maximum minimum wage the government could choose (be sure to show your work); □ the changes in CS and PS caused by the policy; and □ the DWL it would create.

HH	Year	Income	Px	Py	X	Y
A	2017	2880	8	12	216	96
	2018	4000	10	10	200	200
B	2017	3600	8	12	300	100
	2018	3800	10	10	285	95
C	2017	1200	8	12	60	60
	2018	2000	10	10	80	120
D	2017	4400	8	12	400	100
	2018	3800	10	10	290	90

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.

(a)   Please: ☐ determine which one is the CD household and calculate its value of *b*; ☐ draw a diagram illustrating the CD household's 2018 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	2018	4000	10	10	200	200
B	2018	3800	10	10	285	95
C	2018	2000	10	10	80	120
D	2018	3800	10	10	290	90

Question 2, continued

Now suppose that in 2018 the government wants to revise the tax system. It wants to impose a $1 tax on X and a $2 subsidy on Y. In addition, it plans to impose a $240 lump sum income tax on the CD household to help keep the net impact of the policy on the government's budget close to zero (such policies are said to be "revenue neutral"). You may assume the supplies of X and Y are perfectly elastic so P_x would rise to $11 and P_y would fall to $8. For convenience, the data for 2018 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 is close to being revenue neutral; ☐ 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	2017	2880	8	12	216	96
	2018	4000	10	10	200	200
B	2017	3600	8	12	300	100
	2018	3800	10	10	285	95
C	2017	1200	8	12	60	60
	2018	2000	10	10	80	120
D	2017	4400	8	12	400	100
	2018	3800	10	10	290	90

Question 3 (15 points)

One of the households in the table to the right regards X and Y as perfect complements and always buys h 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 h, P_x, P_y 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 h.

HH	Year	Income	Px	Py	X	Y
A	2018	4000	10	10	200	200
B	2018	3800	10	10	285	95
C	2018	2000	10	10	80	120
D	2018	3800	10	10	290	90

Question 3, continued

Now suppose that in 2018 government imposes a slight variation on the policy from Question 2: a $1 tax on X and $2 subsidy on Y (both the same as before), but imposes a $233 lump sum income tax on the PC household (slightly less than before).

(b)   Please compute: □ the PC household's new equilibrium; □ the overall effect on the government's budget, and indicate whether the policy is close to being revenue neutral; □ briefly explain why the revenue result differs from that in Question 2; □ 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. Also shown are the household's demand equations and its expenditure function.

$$U = (X^{0.5} + Y^{0.5})^2 \quad \Big| \quad X = \frac{M * P_y}{P_x * (P_x + P_y)} \quad \Big| \quad Y = \frac{M * P_x}{P_y * (P_x + P_y)} \quad \Big| \quad M = U * \left(\frac{P_x * P_y}{P_x + P_y}\right)$$

Initially, $P_x = \$12$, $P_y = \$12$, and M = $4,200. The government is considering a policy that would place a \$4 subsidy on X. The supply of X is perfectly elastic and its price would fall to $P_x = \$8$.

(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 cost of the subsidy to the government; □ the CV for the policy; and □ the policy's income and substitution effects for the X good. *Extra credit:* □ determine which of the households in the table in Questions 2 and 3 has these preferences. Be sure to show your work.

Question 5 (15 points)

An individual is concerned about consumption in two periods: 0 and 1 and would like to have 6 units of consumption in period 0 for every 5 units of consumption in period 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 \$60,000. She can borrow or save at an interest rate of 25%.

(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.