

SUID:

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**Exam 2**  
Spring 2016

**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 72 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 algebraic relationships for exponents:

$$(AB)^c = A^c B^c, \quad A^c A^d = A^{c+d}, \quad (A^c)^d = A^{cd}$$

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

$$U = X^g Y^{1-g} \quad X = \frac{gM}{P_X} \quad Y = \frac{(1-g)M}{P_Y}$$

**Question 1 (12 points)**

Suppose a labor market is initially in equilibrium at a wage of \$10 and with 2 million workers employed. No minimum wage is in effect but the government is considering imposing one at \$15. The elasticity of demand for labor is known to be -0.2 and the elasticity of labor supply is known to be 1.

- (a) *12 points.* Please determine the number of workers who would be employed if the minimum wage is adopted. Then determine the changes in CS and PS that would be caused by the policy and the DWL it would create.

**Question 2 (12 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	P <sub>x</sub>	P <sub>y</sub>	X	Y
A	2015	2880	20	16	64	100
	2016	2304	18	18	64	64
B	2015	3800	20	16	150	50
	2016	3744	18	18	156	52
C	2015	3200	20	16	120	50
	2016	3600	18	18	150	50

- (a) Please determine which one is the CD household and calculate its value of  $g$ .
- (b) Draw a diagram illustrating the CD household's 2016 equilibrium.
- (c) Please *derive* the expenditure function for the CD household. Be sure to show all the steps, not just the final result.

**Question 3 (12 points)**

Now suppose that in 2016 the government wishes to reduce increase consumption of X and decrease consumption of Y. To do that, it imposes a \$2 subsidy on X and \$6 tax on Y. To help cover the cost of the subsidy, it also imposes a “lump sum” tax of \$336 on the household (that is, the household’s income falls by \$336 under the policy). You may assume the supplies of X and Y are perfectly elastic so  $P_x$  would fall to \$16 and  $P_y$  would rise to \$24.

- (a) Please calculate the new values of X and Y under the policy and then calculate the overall effect of each policy on the government’s budget. Does the policy break even?
- (b) Please calculate the compensating variation for the policy and indicate whether the household is better or worse off.

**Question 4 (12 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.

HH	Year	Income	Px	Py	X	Y
A	2015	2880	20	16	64	100
	2016	2304	18	18	64	64
B	2015	3800	20	16	150	50
	2016	3744	18	18	156	52
C	2015	3200	20	16	120	50
	2016	3600	18	18	150	50

- (a) Determine which one of the households in the table has perfect complements preferences and calculate the value of  $d$ .
- (b) Please *derive* the PC household's demand equations for X and Y in terms of  $d$ ,  $P_x$ ,  $P_y$  and income  $M$ . Be sure to show the steps involved, don't just write down the equations.

Now suppose that in 2016 government imposes a \$4 tax on Y and its price rises to \$22 (that is, starting from the numbers in the table—don't include the policy in the previous question). At the same time, it gives the household a cash transfer of \$132.

- (c) Please compute the PC household's new equilibrium and show it on a diagram. Then calculate the CV for the policy and indicate whether the household is better or worse off. Finally, calculate the revenue for the policy and determine the overall change in SS.

### Question 5 (12 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. Be careful about subscripts: the denominators in the demand equations are different.

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

$$M = -100P_y + 2 * U * P_x^{0.5} P_y^{0.5} \quad Y = -50 + \frac{0.5 * M}{P_y}$$

Initially,  $P_x = \$5$ ,  $P_y = \$5$  and  $M = \$1000$ . The government is considering a policy that would place a \$5 tax on X while also giving the household a \$100 cash transfer. The supply of X is perfectly elastic and  $P_x$  would rise to \$10.

- Please calculate the initial equilibrium before the policy is enacted (both X and Y) and the new value of X with the policy in place (it's OK to skip the new value of Y).
- What is the compensating variation for the policy. Is the household better or worse off?
- Calculate the policy's income and substitution effects for the X good.

**Question 6 (12 points)**

An individual is concerned about consumption in two periods: 0 and 1. In period 0 his income is \$30,000 (an entry-level job) and in period 1 it will be \$200,000 (full salary later in his career). His preferences over bundles of consumption in the two periods,  $C_0$  and  $C_1$ , are given by a Cobb-Douglas utility function:  $U = C_0^{0.25} C_1^{0.75}$ . He can borrow or save at an interest rate of 10%.

- (a) Please determine how much he consumes in each period and then determine the amount he borrows or saves in period 0.
- (c) Illustrate your results with an appropriate diagram showing his intertemporal budget constraint, an indifference curve, his equilibrium, and the amount of borrowing or saving.