

Economics 3010  
Intermediate Microeconomics, Fall 2017  
Problem Set 2

October 26, 2017

The following questions are meant to demonstrate your basic understanding of the topics covered. Answer the following questions correctly to receive full credit.  
Note: items marked with \*\* are not required, but recommended

## 1 Cobb Douglas

Let  $I$ ,  $p_x$ , and  $p_y$  represent income and prices. Suppose  $U(x, y) = x^a y^b$  where  $a, b > 0$

- Calculate the MRS.
- Find the optimal bundle and use a graph to depict the optimum.
- Calculate the elasticity of demand for good  $x$  and for good  $y$ .
- Calculate the cross price elasticity for good  $x$  and for good  $y$ .
- Calculate the income elasticity for good  $x$  and for good  $y$ .

## 2 Perfect Substitutes

Let  $I$ ,  $p_x$ , and  $p_y$  represent income and prices. Suppose  $U(x, y) = ax + by$  where  $a, b > 0$

- Calculate the MRS.
- Find the optimal bundle and use a graph to depict the optimum.
- Calculate the elasticity of demand for good  $x$  and for good  $y$ .
- Calculate the cross price elasticity for good  $x$  and for good  $y$ .
- Calculate the income elasticity for good  $x$  and for good  $y$ .

## 3 Perfect Compliments

Let  $I$ ,  $p_x$ , and  $p_y$  represent income and prices. Suppose  $U(x, y) = \min\{ax, by\}$  where  $a, b > 0$

- Calculate the MRS.
- Find the optimal bundle and use a graph to depict the optimum.
- Calculate the elasticity of demand for good  $x$  and for good  $y$ .
- Calculate the cross price elasticity for good  $x$  and for good  $y$ .
- Calculate the income elasticity for good  $x$  and for good  $y$ .

## 4 Quasi-Linear

Let  $I$ ,  $p_x$ , and  $p_y$  represent income and prices. Suppose  $U(x, y) = -x^{-1} + y$  where  $a, b > 0$

- Calculate the MRS.
- Find the optimal bundle and use a graph to depict the optimum.
- Calculate the elasticity of demand for good  $x$  and for good  $y$ .
- Calculate the cross price elasticity for good  $x$  and for good  $y$ .
- Calculate the income elasticity for good  $x$  and for good  $y$ .

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## 5 Challenging Utility Max

Let  $I$ ,  $p_x$ , and  $p_y$  represent income and prices. Suppose  $U(x, y) = (\rho + (1 - \alpha)y^\rho)^{1/\rho}$ .

- Calculate the MRS.
- \*\*Find the optimal bundle\*\*

## 6 Demand and Income

Sarah has an income of  $I$  and likes to consume apples and bananas. Sarah faces prices of  $p_a$  and  $p_b$  for apples and bananas respectively. Sarah's utility function for apples and bananas is  $U(a, b) = \ln(a) + 2\ln(b)$ .

- Solve for Sarah's optimal bundle given this information. Fully characterize the solution.
- Let  $p_a = 1$  and  $p_b = 4$ . Give the equation for the Engel curve as well as the optimal values of  $a$  and  $b$  in terms of  $I$ . Graph both the Engel curve and income consumption curve using the same kind of two-panel diagram that was used in class.
- Let  $I = 4$  and  $p_b = 4$ . Give the equation for the demand curve as well as the optimal values of  $a$  and  $b$  in terms of  $p_a$ . Graph both the demand curve and price consumption curve using the same kind of two-panel diagram that was used in class.

## 7 \*\*Extra Problems\*\*

For the utilities in Problem 1, 2, 3, and 4, solve for the Engel curve, Demand curve, PCC, ICC. Graph your answers.