

# Practice Midterm Exam

EC 311 - Intermediate Microeconomics

Winter 2024

<b>Note: This practice exam is only half-length of the actual exam</b>
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Name: ANSWER KEY 95#: \_\_\_\_\_

The maximum amount of points on this exam is 80 points. You have a total of 1h 50min (110 minutes) to complete the exam. The only items allowed on your desk at any time are a pen and/or pencil, scratch paper, a 3x5 note card, and a calculator. Everything else must be stored in your bag underneath your desk. Any form of cheating will result on a zero on the exam.

There are three sections to be completed:

- **Multiple Choice:** 5 Questions
- **Short-Answer Questions:** 2 Questions
- **Multi-Part Analysis Questions:** 1 Questions

Point totals and question specific instructions are listed for each section.

The exam is a total of 4 pages. **Please verify you have all 4 in your exam. If you do not, let me know immediately.**

## Multiple Choice

1. Consider the following utility function  $U(x, y) = 200x + 5y$ .  $x$  costs \$100 each and  $y$  costs \$2 each. If you have \$500 to spend, how much  $x$  will you consume at the utility-maximizing bundle?

- A. 1  
B. 2.5  
C. 10  
**D. 0**

Answer MRS ? Price Ratio  $\rightarrow \frac{200}{5} ? \frac{100}{2}$   
 $40 < 50$   
 MRS < 50  
 $\hookrightarrow$  Consume only  $y \rightarrow x=0$

2. What does it mean for  $Y$  to be an inferior good?

- A. When your income goes up, demand for  $y$  goes up  
**B. When your income goes up, demand for  $y$  goes down**  
 C. When the price of  $x$  goes up, demand for  $y$  goes down  
 D. When the price of  $y$  goes up, demand for  $y$  goes down

3. If you have an MRS equal to 3, which of the following statements is true?

- A. You would be willing to give up 1 unit of  $y$  for 3 units of  $x$   
**B. You would be willing to give up 3 units of  $y$  for 1 unit of  $x$**   
 C. You would be willing to give up 1/3 units of  $y$  for 1 unit of  $x$   
 D. You would be willing to give up 3 units of  $y$  for 3 units of  $x$

$$MRS = \frac{MU_x}{MU_y} = \frac{3}{1}$$

$x$  is 3-times as valuable as  $y$

4. Your utility function is  $U(x, y) = x^{0.1}y^{0.9}$ . How many units of  $y$  are you willing to give up for one unit of  $x$  when  $(x, y) = (2, 9)$ ?

- A. 9  
B. 1/9  
C. 2  
**D. 1/2**

$$MRS = \frac{0.1}{0.9} \cdot \frac{y}{x} = \frac{1}{9} \cdot \frac{y}{x} = \frac{1}{9} \cdot \frac{9}{2} = \frac{1}{2}$$

5. Anca's preferences over Coffee ( $C$ ) and RedBull ( $R$ ) are given by

$$U(C, R) = \alpha C + \alpha^2 R$$

Anca's income is given by  $M$  and prices are given by  $P_C$  and  $P_R$ , respectively. Assuming she is maximizing her utility, under which condition will she only consume RedBull? (i.e.  $C^* = 0$  and  $R^* = \frac{M}{P_R}$ )

- A.  $\frac{P_C}{P_R} > \frac{1}{\alpha}$**   
 B.  $\frac{P_C}{P_R} = \frac{1}{\alpha}$   
 C.  $P_C = \alpha P_R$   
 D.  $P_R > P_C$

To consume only  $y$  we must have  $MRS < P_C/P_R$

$$MRS < \frac{P_C}{P_R} \quad ; \quad MRS = \frac{\alpha}{\alpha^2} = \frac{1}{\alpha}$$

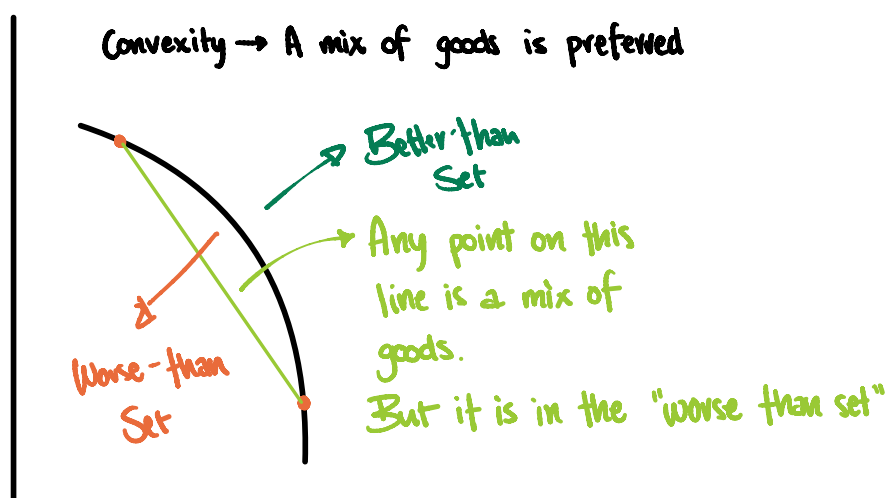
$$\frac{1}{\alpha} < \frac{P_C}{P_R}$$

## Short Answer

Answer the following questions to the best of your ability. For full credit, show all of your work and clearly indicate your final solution for each party by circling the answer.

8. Recall the convexity property of indifference curves. Create a graph that violates that property. Explain how this graph leads to an illogical conclusion.

Hint: Recall the usual behavior of Indifference curves



9. What is the slope of the budget line in the  $(x, y)$  plane corresponding to the budget  $3x + 12y = 19$ ? Make a graph showing the Budget Line and properly label the  $x$  and  $y$  intercepts

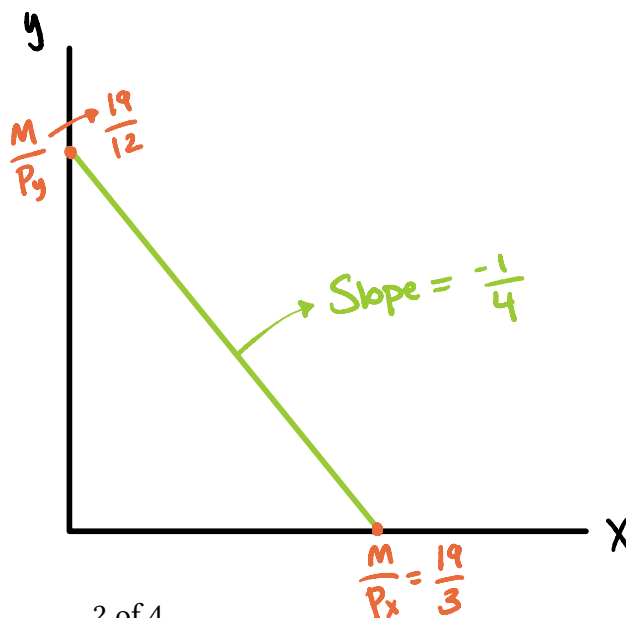
Slope is negative Price Ratio:  $-P_x/P_y$

$$\hookrightarrow \frac{-P_x}{P_y} = \frac{-3}{12} = -\frac{1}{4}$$

$x$ -intercept is where  $y=0$   
 $y$ -intercept is where  $x=0$

For  $x$ :  $3x + 12y = 19$   
 $3x = 19$   
 $x = 19/3$

For  $y$ :  $3x + 12y = 19$   
 $12y = 19$   
 $y = 19/12$



## Long Answer

Answer the following questions to the best of your ability. For full credit, show all of your work and clearly indicate your final solution for each party by circling the answer. Be sure to properly label any and all graphs you make.

11. Consider the demand function  $x^* = M - P_x^2 + P_y^{0.5}$

(a) Is  $X$  a normal or inferior good? Use a derivative and an inequality to show it

$\frac{\partial x^*}{\partial M}$  lets us classify the good as normal or inferior

$$\frac{\partial x^*}{\partial M} = 1 > 0 \rightarrow X \text{ is a normal good}$$

(b) Is  $X$  a substitute or complement for  $Y$ ? Use a derivative and an inequality to show it

$\frac{\partial x^*}{\partial P_y}$  will tell us if  $x$  is a sub. or complement for  $y$ .

$$\frac{\partial x^*}{\partial P_y} = \frac{1}{2} \cdot P_y^{-1/2} = \frac{1}{2P_y^{1/2}} > 0 \rightarrow X \text{ is a substitute}$$

- (c) Assume that  $M = 10$  and  $P_y = 4$  (remember that raising something to the power 0.5 is the same as taking its square root). Graph the demand curve for  $X$  by plotting the points where  $P_x = 1, 2$ , and  $3$  and connecting them. Label this curve  $x^*$ . I recommend giving yourself lots of extra room on the horizontal axis so that you can add the next part clearly.

Add to the graph a market demand curve, assuming that there are 3 total consumers in the market. There's no need to derive the market demand curve, just remember the right way to add up demand in the graph. Label this curve  $Q_d$ .

$$x^* = M - P_x^2 + P_y^{0.5}$$

$$x^* = 10 - P_x^2 + 4^{0.5}$$

$$x^* = 10 - P_x^2 + 2 \rightarrow$$

$$x^* = 12 - P_x^2$$

Use given values of  $P_x$  to find  $x^*$

$P_x$	$x^*$
1	11
2	8
3	3

Market Demand for 3 identical consumers means  $Q_d = 3 \cdot x^*$

$$Q_d = 3(12 - P_x^2) \\ = 36 - 3P_x^2$$

$P_x$	$Q_d$
1	33
2	24
3	9

