Monmouth COLLEGE

- Name: _____
- Date: _____
- Section: _____

ECON 300: Intermediate Price Theory

Problem Set #4

INSTRUCTIONS:

- This problem set is not graded.

Problem 1. Utility Maximization

The consumer is participating in a market with good x and good y. The market prices are given as $P_x = 3$ and $P_y = 2$, respectively. The consumer's income is $M = 45$, and their utility functions are:

$$u(x, y) = min\{2x, 3y\}$$

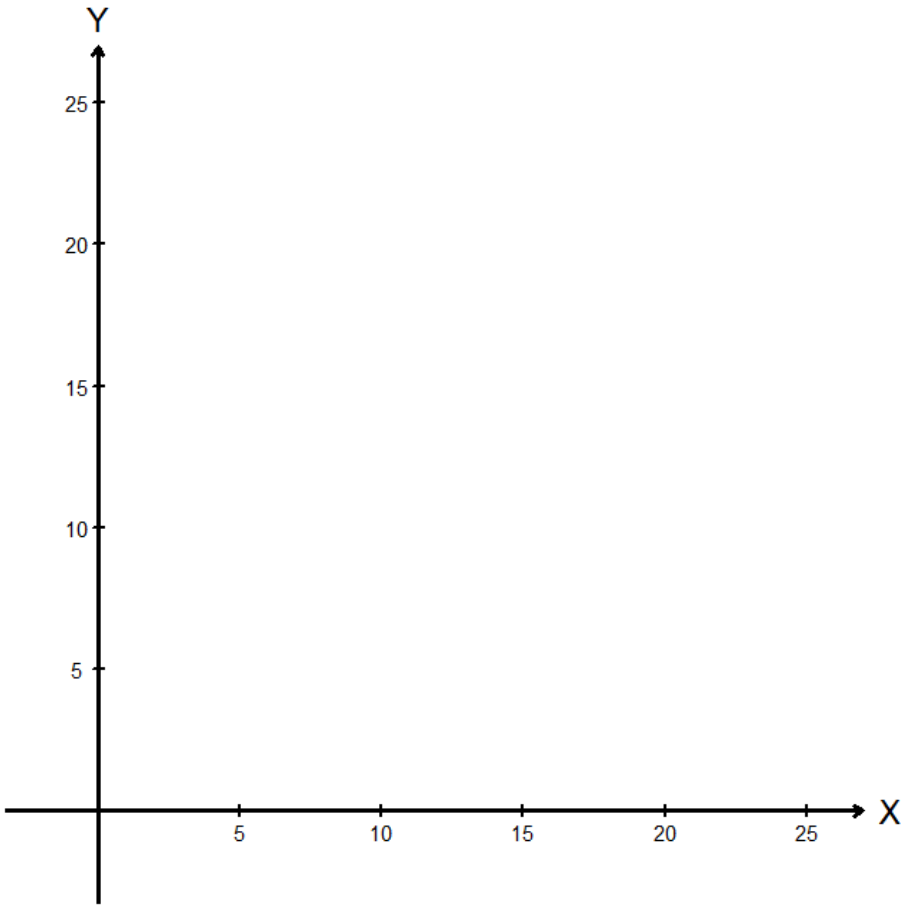
1.A What does the functional form of the utility function imply about the relationship between goods x and y?

1.B What is the optimal ratio of goods x and y?

1.C What is the mathematical expression of the consumer's budget constraint?

1.D Find the optimal bundle (x^*, y^*).

1.E Plot and label the consumer's optimization problem in the commodity space.



Problem 2. Utility Maximization

The consumer is participating in a market with good x and good y. The market prices are given as $P_x = 3$ and $P_y = 5$, respectively. The consumer's income is $M = 60$, and their utility functions are:

$$u(x, y) = x^3 y^2$$

2.A Find the expressions for the marginal utilities of good x and good y.

- $MU_x =$

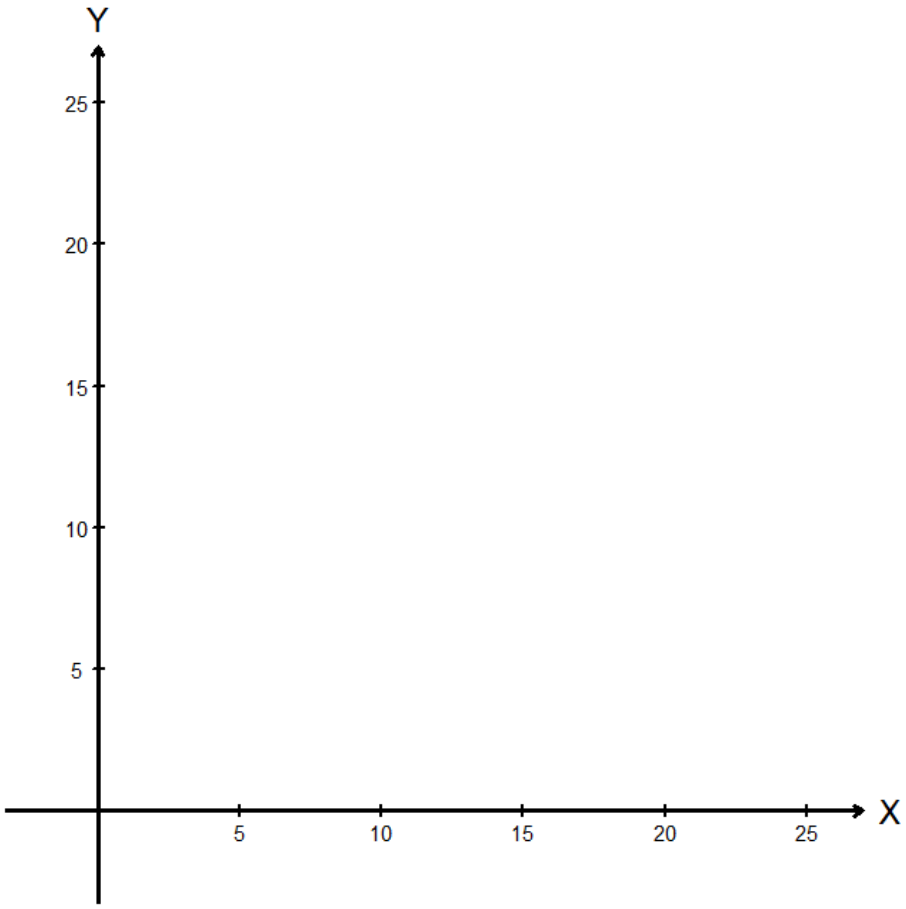
- $MU_y =$

2.B What is the optimal ratio of goods x and y?

2.C What is the mathematical expression of the consumer's budget constraint?

2.D Find the optimal bundle (x^*, y^*).

2.E Plot and label the consumer's optimization problem in the commodity space.



Problem 3. Individual to Market Demand

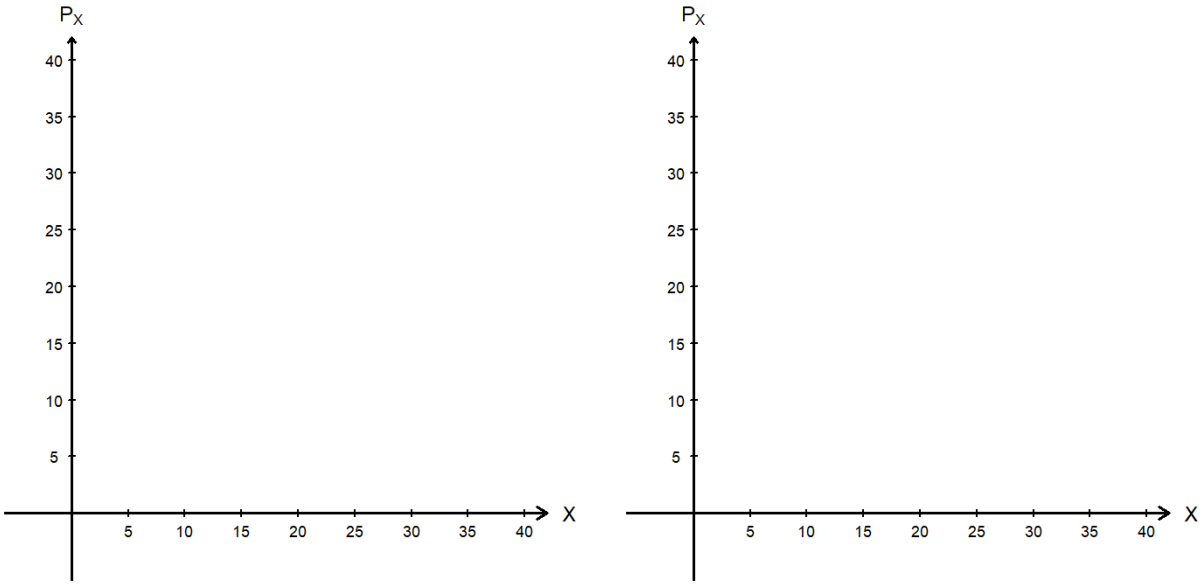
Suppose we have a market for good x with two consumers. Their individual demand functions are:

- Consumer 1: $x_1 = 10 - \frac{1}{4}P_x$
- Consumer 2: $x_2 = 20 - \frac{2}{3}P_x$

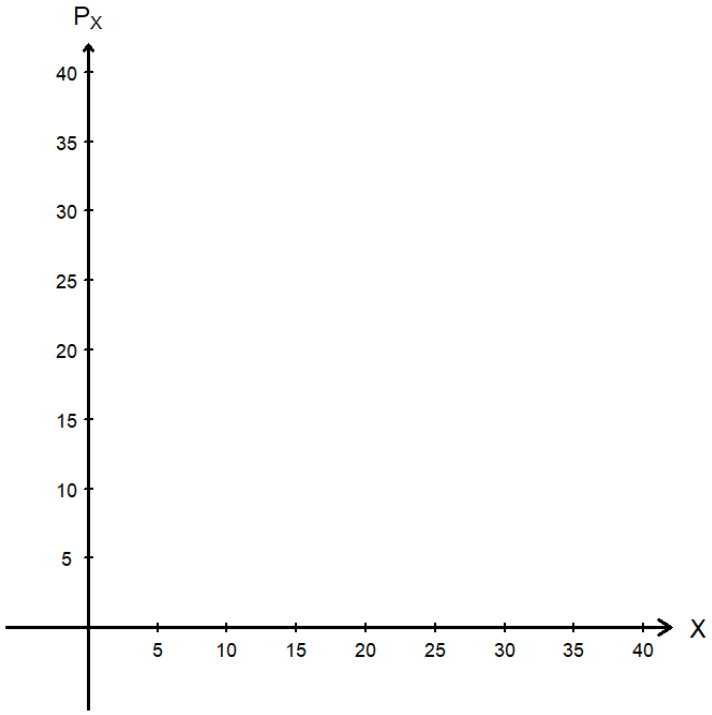
3.A Find the inverse demand function for consumer 1.

3.B Find the inverse demand function for consumer 2.

3.C Plot the consumer 1's demand curve to the left, and consumer 2's demand curve to the right.



3.E Plot the market demand for good x.



3.D (ADVANCED) Find the formula for the market demand.

Problem 4. Own Price Elasticities and Revenues

The market price for good x is currently $P_x = 600$, and the market demand for good x is given as:

$$X = 5,000 - 5P_x$$

4.A Calculate the (own) price elasticity of demand for good x.

4.B Complete the following statement regarding the (own) price elasticity of demand:

"When the price of good x increases by 1%, then
the quantity demanded of x decreases by ____ %."

4.C Would you consider the demand for good x to be inelastic? elastic? unit-elastic? Why?

4.D Calculate the Total Revenue (in terms of price) for the producer of good x.

4.E Find the expression for Marginal Revenue (in terms of price) for the producer of good x.

4.F Is the producer maximizing their revenue if the market price is set at $P_x = 600$? Why?

4.G If the price of good x decreases to $P_x = 500$, is the demand for good x inelastic? elastic? unit-elastic? Why?

4.H Is the producer maxmizing revenue when the market price is set at $P_x = 500$? Why?

Problem 5. Other Types of Elasticities

The current price of good x is $P_x = 10$, the price of good y is $P_y = 20$, and the overall income level of the economy is $M = 100$. The market demand for good x is given as follows:

$$X = 500 - 30P_x + 5M + 10P_y$$

5.A Calculate the (own) price elasticity of demand for good x.

5.B Complete the following statement regarding the (own) price elasticity of demand:

"When the price of good x increases by 1%, then
the quantity demanded of x decreases by ____ %."

5.C Would you consider the demand for good x to be elastic? Why?

5.D Is good x an ordinary good or a Giffen good? Why?

5.E If the price of good x increases to $P_x = 30$, is the demand for good x elastic? Why?

5.F Calculate the income elasticity of demand when $P_x = 30$, $P_y = 20$, $M = 100$.

5.G Complete the following statement regarding the income elasticity of demand:

"When the consumers' income increases by 1%, then the quantity demanded of x increases by ____ %."

5.H Is good x a luxury good or a necessary good? Why?

5.I Calculate the cross price elasticity of demand when $P_x = 30, P_y = 20, M = 100$.

5.J Complete the following statement regarding the income elasticity of demand:

"When the price of good y increases by 1%, then the quantity demanded of x increases by ____ %."

5.K Is good y a complement to good x? Is it a substitute to good x? Why?