

**Part 2 – Problems (34 points total) – Be sure to show all work**

1. **(6 points total)** An individual consumes goods X and Y and spends \$40 per time period. The prices of the two goods are \$4 per unit for X and \$2 per unit for Y. The consumer in this case has a utility function expressed as:

$$U = X^2Y^2$$

- a. **(5 points)** Using the Lagrangian method, determine the values of X and Y that will maximize utility in the consumption of X and Y. **(You must show the Lagrangian method)**

- b. **(1 point)** Determine the total utility the individual will achieve by consuming the utility maximizing amounts of X and Y.

2. **(6 points total)** Jose is interested in analyzing the market for purple cheese. The company's economists estimate the following equations for the demand and supply curves:

$$Q_d = 150 - 3P \quad Q_s = 30 + 9P$$

Quantities are measured in thousands of pieces and prices are measured in dollars per piece.

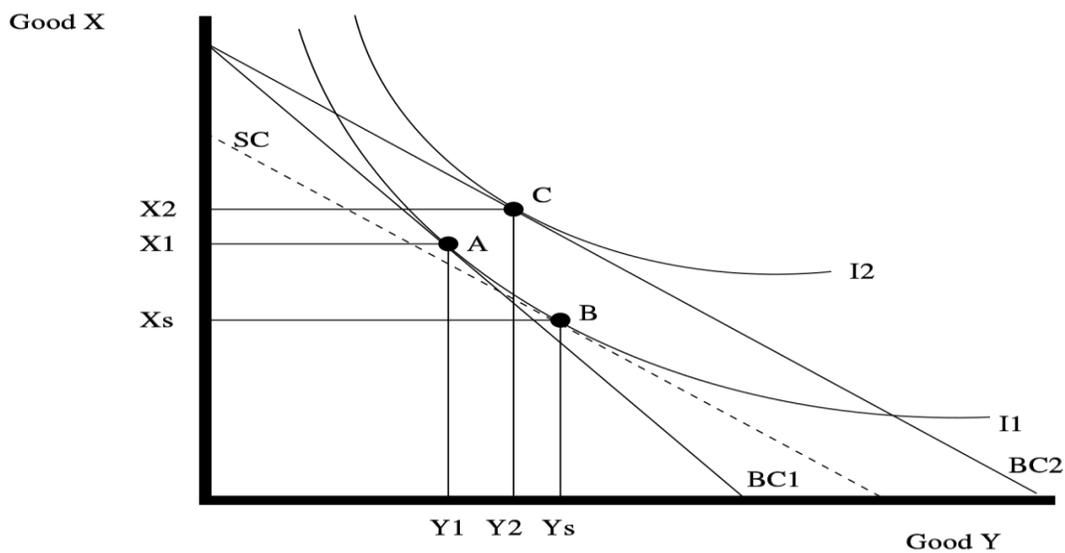
- a. **(3 points)** Calculate the equilibrium price and quantity.

- b. **(3 points)** Calculate the price elasticities of supply and demand at the equilibrium values.

3. **(6 points total)** The demand curve for sardines is  $Q_S = 50000 - 500 P_S$  where  $Q_S$  is the quantity demanded of sardines (in cans) and  $P_S$  is the price of sardines (in \$ per can).
- a. **(3 points)** If the supply of sardine is perfectly elastic at a price of \$10.00 per can, what is the equilibrium quantity of cans of sardines? (graphing the curves may help)
- b. **(3 points)** What would be the effect on the price and quantity of cans of sardine if the government imposes a tax of \$1.00 can? (Show graphically and explain).
4. **(6 points total)** Mr. Bill has the following utility function  $U = 0.5\ln X + 0.5\ln Y$
- a. **(3 points)** Derive Mr. Bill's demand function for good X

b. (3 points) Given the demand function for X, what is the elasticity of demand for x. Show.

5. (5 points total) A consumer's original utility maximizing market basket of goods is shown in the figure above as point A. Following a price change, the consumer's utility maximizing market basket changes is at point C.



- (1 point) What is the substitution effect \_\_\_\_\_
- (1 point) What is the income effect? \_\_\_\_\_
- (1 point) Good X is an Inferior, Normal, or Giffen good. Write correct answer \_\_\_\_\_
- (2 points) Is the demand for Good Y elastic or inelastic? \_\_\_\_\_ Prove (in words or mathematically).

6. (4 points total) For each of the following utility functions, compute the Marginal utility of X. Is the marginal utility of X increasing, decreasing or is constant? Prove.

a. (2 points) 
$$U = (x)^2 (y + 2)$$

b. (2 points) 
$$U = 3x + 2y$$

7. (1 point) What types of goods are X and Y, if the utility function is given as  $U = (\min 2x, \min 2y)$ .

Answer: \_\_\_\_\_