

**Birzeit University**  
**Economic Department**

**Economics 3311 — Intermediate Microeconomics I**

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*First Exam*

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**Question # 1 : (10 points)**

1. Suppose the demand curve for a product is given by  $Q=300-2P+4I$ , where  $I$  is average income measured in thousands of dollars. The supply curve is  $Q=3P-50$ .

a. If  $I=25$ , find the market clearing price and quantity for the product.

at eq  $\Rightarrow Q_s = Q_d$

$$3P-50 = 300 - 2P + 4(25)$$

$$3P-50 = 400 - 2P$$

$$\frac{5P}{5} = \frac{450}{5}$$

$$\Rightarrow P = 90 \$$$

10

$$Q = 3(90) - 50$$

$$Q = 220 \text{ units}$$

b. If  $I=50$ , find the market clearing price and quantity for the product.

at eq  $\Rightarrow Q_s = Q_d$

$$3P-50 = 300 + 2P + 4(50)$$

$$3P-50 = 500 - 2P$$

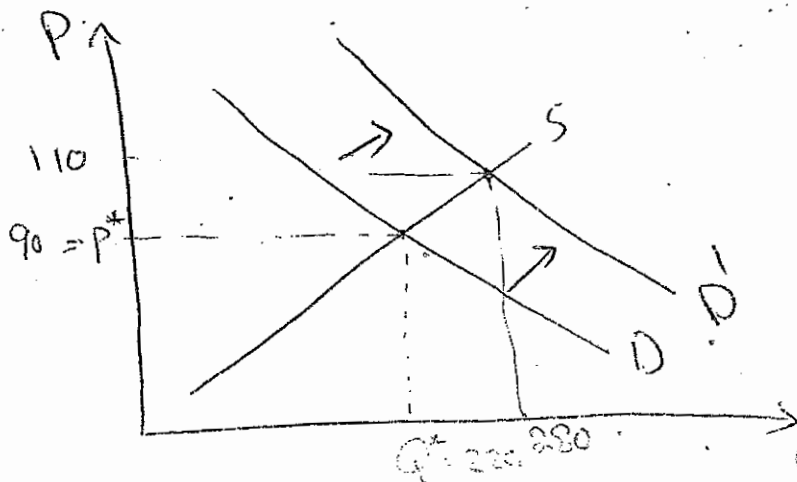
$$\frac{5P}{5} = \frac{550}{5}$$

$$\Rightarrow P = 110 \$$$

$$Q = 3(110) - 50$$

$$Q = 280 \text{ units}$$

c. Draw a graph to illustrate your answers.



Demand curve shift to the right because the Income is Increase.

Question #2: (10 points)

Suppose the demand curve for a product is given by  $Q=10-2P+P_s$ , where  $P$  is the price of the product and  $P_s$  is the price of a substitute good. The price of the substitute good is \$2.00.

Suppose  $P=\$1.00$ . What is the price elasticity of demand? What is the cross-price elasticity of demand?

$$Q = 10 - 2(1) + 2 = 10 \text{ units.} \quad / \quad \frac{\partial Q}{\partial P} = -2$$

$$\textcircled{1} E_p = \frac{\% \Delta Q_x}{\% \Delta P_x} = \frac{\Delta Q/Q}{\Delta P/P} = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} = \frac{\partial Q}{\partial P} \cdot \frac{P}{Q} = -2 \cdot \frac{1}{10/5} = -\frac{1}{5} < 1$$

$$\textcircled{2} E_{x,y} = \frac{\% \Delta Q_x}{\% \Delta P_y} = \frac{\Delta Q/Q}{\Delta P_s/P_s} = \frac{\Delta Q}{\Delta P_s} \cdot \frac{P_s}{Q} = \frac{\partial Q}{\partial P_s} \cdot \frac{P_s}{Q} = 1 \cdot \frac{2}{10/5} = \frac{1}{5}$$

$x, y$  is Substitute.

b. Suppose the price of the good,  $P$ , goes to \$2.00. Now what is the price elasticity of demand? What is the cross-price elasticity of demand?

$$Q = 10 - 2P + P_s = 10 - 2(2) + 2 = 8$$

$$\textcircled{1} E_p = \frac{\% \Delta Q_x}{\% \Delta P_x} = \frac{\Delta Q/Q}{\Delta P/P} = \frac{\partial Q}{\partial P} \cdot \frac{P}{Q} = -2 \cdot \frac{2}{8} = -\frac{2}{5}$$

$$\textcircled{2} E_{x,y} = \frac{\% \Delta Q_x}{\% \Delta P_y} = \frac{\Delta Q/Q}{\Delta P_s/P_s} = \frac{\Delta Q}{\Delta P_s} \cdot \frac{P_s}{Q} = \frac{\partial Q}{\partial P_s} \cdot \frac{P_s}{Q} = 1 \cdot \frac{2}{8} = \frac{1}{5}$$

$\therefore$  price elasticity of demand decreases from  $-\frac{1}{5}$  to  $-\frac{2}{5}$

because the price of  $x$  increase.

$E_p \propto \% P_x \rightarrow$  negative relationship.

but cross-price elasticity of demand not change

because it don't depend on price of  $x$ .



$$\text{slope} = \frac{\Delta Y}{\Delta X} = MRS$$

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

**Question # 3: (30 points)** 26

Elizabeth has the following utility function for goods X and Y  $U(X, Y) = 2XY$ . And her marginal utilities are given by:  $MUX = 2Y^2$ ,  $MUY = 4XY$ . Her income is

I \$500 per unit of time, the price of X equals \$10 per unit, and the price of good Y equals \$15 per unit.

- a. Write the expression for indifference curve when she gets utility level of 40. And along the indifference curve you found, calculate the numbers of units of X when Y=4.

$$U(x, y) = 2x(4)$$

~~Slope of indifference curve =  $\frac{\Delta Y}{\Delta X} = MRS = \frac{MU_x}{MU_y}$~~

~~$\frac{\partial U}{\partial X} = 2Y^2$~~

~~$\frac{\partial U}{\partial Y} = 4XY$~~

~~$40 = \frac{2Y^2}{4XY}$~~

~~$40 = \frac{2(4)^2}{4x(4)}$~~

~~$40 = \frac{32}{16x}$~~

~~$40 = \frac{2}{x}$~~

~~$x = \frac{2}{40} = \frac{1}{20}$~~

$U(x, y) = 2XY$

$40 = 2x(4)$

$40 = 2 \times 16$

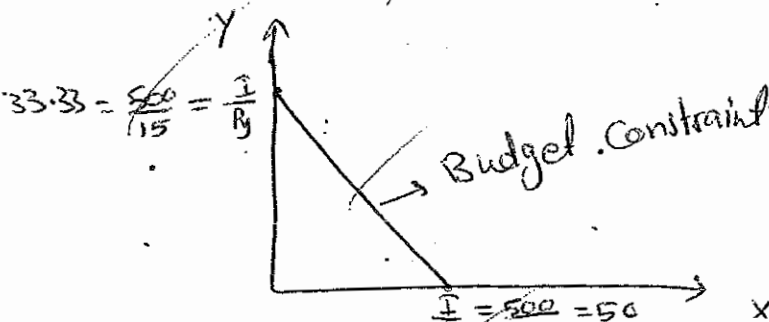
$540 = x$

$432$

- b. Write the expression of budget constraint, graph it and determine its slope.

$$P_x \cdot X + P_y \cdot Y = I \Rightarrow 10X + 15Y = 500$$

$$x = \frac{5}{4}$$



~~slope =  $-\frac{P_x}{P_y}$~~

~~$= -\frac{10}{15} = -\frac{2}{3}$~~

- c. Determine the X, Y combination which maximize her utility

$$10X + 15Y = 500 \quad \text{--- ①}$$

to max utility

$$\frac{MU_x}{MU_y} = \frac{P_x}{P_y} \Rightarrow \frac{2Y^2}{4XY} = \frac{10}{15} \Rightarrow \frac{30Y}{30} = \frac{40X}{30} \Rightarrow Y = \frac{4}{3}X \quad \text{--- ②}$$

① & ②

$$10X + 15 \cdot \frac{4}{3}X = 500 \Rightarrow 10X + 20X = 500 \Rightarrow \frac{30X}{30} = \frac{500}{30}$$

$$x = \frac{50}{3}$$

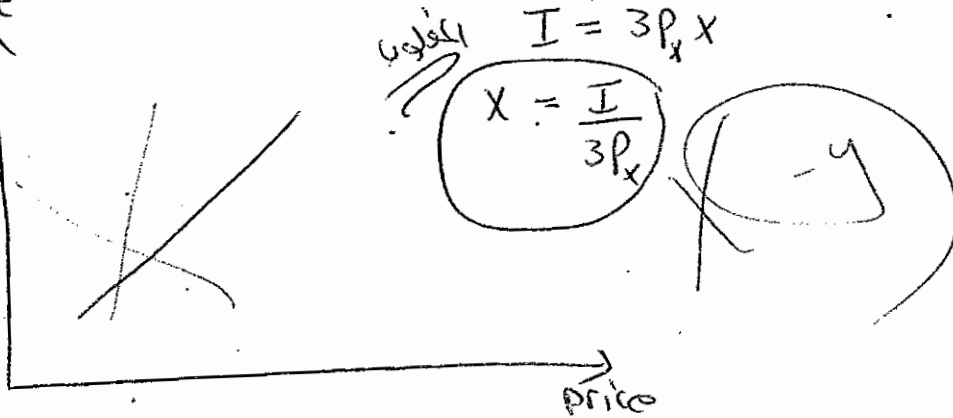
$$Y = \frac{4}{3} \cdot \frac{50}{3} = \frac{200}{9} \Rightarrow y = \frac{200}{9}$$

she maximize utility if consume  $\frac{50}{3}$  units of X &

$$MRS = \frac{y}{2x} = \frac{P_x}{P_y} \Rightarrow y P_y = 2x P_x \dots \text{--- (1)}$$

$$I = P_x x + P_y y \Rightarrow P_x x + 2x P_x = 3P_x x$$

d. Derive the demand curve for good x as a function of price and income.



e. Suppose now the price of X is changed to 15, calculate the impact on her optimum choice.

$$15x + 15y = 500 \dots \text{--- (1)}$$

to max utility :-

$$\frac{MU_x}{MU_y} = \frac{P_x}{P_y} \Rightarrow \frac{2y}{4xy} = \frac{15}{15} = 1 \Rightarrow \frac{2y}{2} = \frac{4x}{2} \Rightarrow y = 2x \dots \text{--- (2)}$$

(1) & (2) into

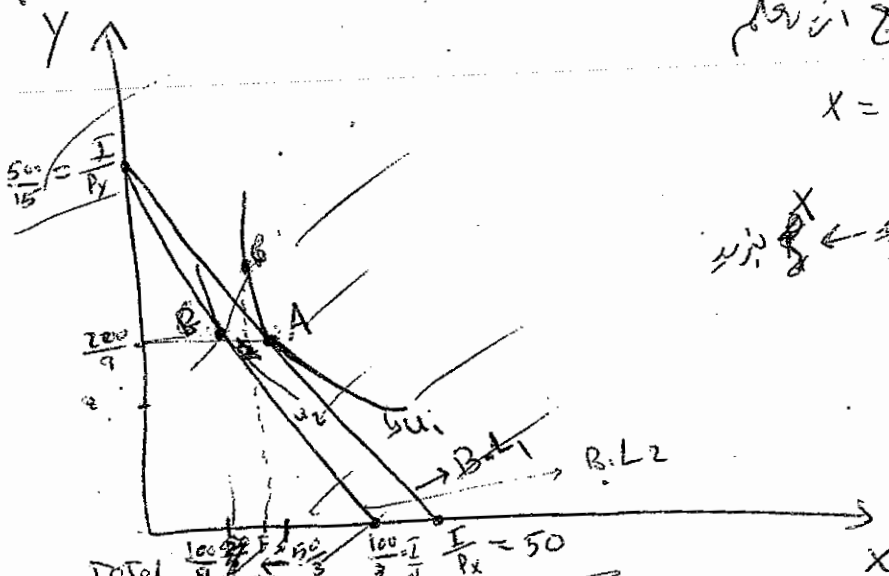
$$15x + 15 \cdot (2x) = 500 \Rightarrow 45x = 500 \Rightarrow x = \frac{100}{9}$$

$$y = 2 \left( \frac{100}{9} \right) = \frac{200}{9}$$

She should consume  $\frac{100}{9}$  units of x &  $\frac{200}{9}$  units of y to max utility

f. In a clearly labeled diagram with Y on the y axis, and X on the x axis, graphically show the effect of the increase of the price of good x, (indifference curves  $u_1$  and  $u_2$ , budget lines  $BL_1$  and  $BL_2$ , quantities of x & y, income effect and substitution effect) all this on the same graph. don't forget to show me your analysis.

x is normal goods



دفعه زياد د پري د

$$x = \frac{I}{3P_x}$$

نور د  $x$  د پري د

normal

$$S.E \Rightarrow P_x \uparrow \Rightarrow Q_x \downarrow$$

$$I.E \Rightarrow P_x \uparrow \Rightarrow P_x \downarrow \Rightarrow (x \text{ is normal}) \Rightarrow Q_x \downarrow$$



⇒ to max  $U_i$

$$\frac{MU_n}{MU_r} = \frac{P_n}{P_r} \Rightarrow \frac{30}{2n} = 1 \Rightarrow \boxed{r=n} \quad \text{--- ②}$$

①  $2r + 2n = 32$

$$2r + 2n = 32$$

$$2r + 2r = 32 \Rightarrow \frac{4r}{4} = \frac{32}{4} \Rightarrow \boxed{r=8}, \boxed{n=8}$$

to maxi utility she ~~should~~ must consume 8 units of r & 8 units of n.

b) ~~12~~ units of r & 4 units of n  
 to maxi utility ~~she~~ <sup>old!</sup> <sub>every side</sub> <sup>(n,r)</sup> has  
 3 units of r

$$2 \times 12 + 2 \times 4 = 32$$

$$24 + 8 = 32 \checkmark$$

c) two units of n & 6 units of r.

$$d) 2 \times 12 + 10 \times 1 = 24 + 10 = 34 \neq 32$$

$$64 - 32 = 32$$

her parents should ~~double the~~  
 give her 32 \$

$$2(4+n) + 2n = 32$$