ECO 201: ELEMENTS OF MICROECONOMICS

SAMPLE QUESTIONS AND ANSWERS

The Theory of Consumer Behaviour

1) Dorcas a level 200 student of Ketasco, calls her parent to send her money to buy Milo which cost $4 each and books which cost $8 each. They sent her 20 pairs of shoes and 20 pairs of new jeans trousers which she can freely sell on the market for $20 and $40 respectively.

a. Write down the equation of Dorcas's budget line and interpret the result.
b. Carefully sketch the budget line
c. If Dorcas discovers that substituting two (2) tins of Milo for three (3) will not change her level of satisfaction, what must be the lowest price of book before she will substitute Milo for books given that the price of Milo remains at $4

Price of Milo, $Pm = \$4$

Price of bread, $P_B = \$8$

Income from shoes (Ys) = 20 pairs of shoes multiplied by $20=$400

Income from Jeans (Yj)=20 pairs of Jeans multiplied by $40 = $800

Total income (Y) =400+800=$1200

(a) $Y = P_m M + P_b B$ -------------------budget line

Dorcas' Budget =4 Milo +8 books =1200

$$4M + 8B = 1200$$

$$\frac{4M}{4} = \frac{1200}{4} - \frac{8B}{4}$$

$M = 300 - 2B$ ----------(1)---------Budget Equation (Milo in terms of Bread)

Alternatively,

$$4M + 8B = 1200$$

$$\frac{8B}{8} = \frac{1200}{8} - \frac{4M}{8}$$

$B = 150 - \frac{1}{2}M$ --------(2)----------Budget Equation (Bread in terms of Milo)

Interpretation:

From (1), if Dorcas buys a book the numbers of Milo she can buy will reduce by two (2). Alternatively, if Dorcas spends all her income on Milo she will buy 300.

From (2), if Dorcas buys 2 tins of Milo the number of books she can buy will reduce by one (1). Alternatively, if Dorcas spends all her income on books she buys 150

b) From equation (1)

$M = 300 - 2B$

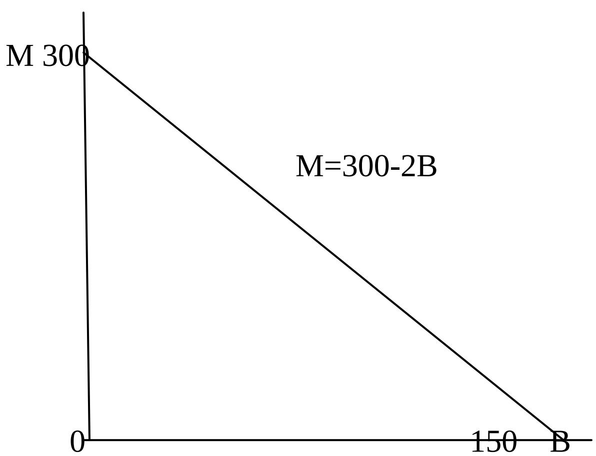
If $B = 0$, $M = 300$

If $M = 0$

$0 = 300 - 2B$

$\frac{300}{2} = \frac{2B}{2}$

$B = 150$



From equation (2)

$B = 150 - \frac{1}{2}M$

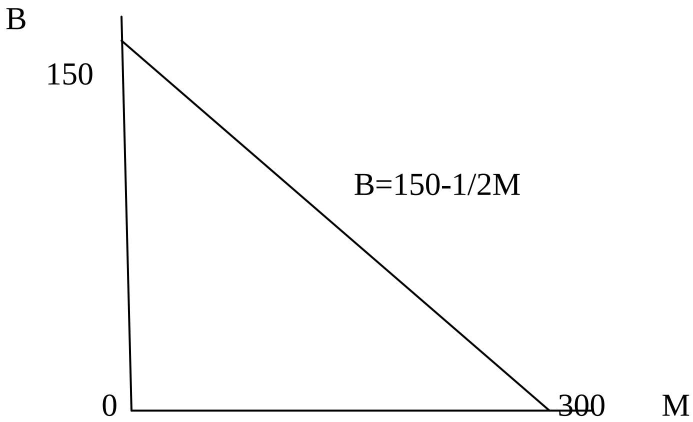
If $M = 0$, $B = 150$

If $B = 0$

$0 = 150 - \frac{1}{2}M$

$$150 = \frac{1}{2}M$$

$$M = 300$$



c) At equilibrium, $MRS_{MB} = \frac{P_M}{P_B}$

But $MRS_{MB} = -\frac{\Delta B}{\Delta M} = \frac{-3}{2} = \frac{3}{2}$

$$P_M = \$4$$

$$MRS_{MB} = \frac{P_M}{P_B}$$

$\frac{3}{2} = \frac{4}{P_B}$ cross multiply

$$\frac{3P_B}{3} = \frac{8}{3}$$

$$P_B = \$2.666$$

The consumer will be in equilibrium when the price of book is $2.6667.

Implication: any price of books above $2.666, Dorcas will substitute Milo for books until she reaches equilibrium.

2) A. Suppose a consumer has $30 available to be divided between commodities A and B and the unit price of B is fixed at $3. What will be his demand equation for A if his utility function is U = $4X_a X_b$?

B. Establish the algebraic relationship between Marginal Revenue (MR) and elasticity of demand.

2) a. $U = 4X_a X_b$ --------------objective function

$M = P_a X_a + P_b X_b$

$M - P_a X_a - P_b X_b$ =0 Implicit constraint function setting the lagrangian function,

$L = 4X_a X_b + \lambda(M - P_a X_a - P_b X_b) - - - - - - - - - - - - (1)$

Differentiating with respect to X_a , X_b and λ

$L_{X_a} = 4Xb - \lambda Pa = 0$ ------------(2)

$L_{X_b} = 4X_a - \lambda P_b = 0$ ------------(3)

$L_\lambda = M - P_a X_a - P_b X_b = 0$ ----------(4)

From (2) & (3)

$4X_b = \lambda P_a$ ------------(5)

$4X_a = \lambda P_b$ -----------(6)

$(5) \div (6)$

$$\frac{4X_b}{4X_a} = \frac{\lambda P_a}{\lambda P_b}$$

$$\frac{X_b}{X_a} = \frac{P_a}{P_b}$$

$$P_b = \frac{X_a P_a}{X_b} - - - - - - - - - - - - - - (7)$$

$M = P_a X_a + P_b X_b$

$$M = P_a X_a + \left(\frac{X_a P_a}{X_b}\right) X_b$$

$M = P_a X_a + P_a X_a$

$$\frac{M}{2P_a} = \frac{2X_a P_a}{2P_a}$$ But M=30

$$X_a = \frac{30}{2P_a}$$

$X_a = \frac{15}{P_a}$ Demand function for commodity A

Alternatively:

$$\frac{MU_{X_a}}{P_a} = \frac{MU_{X_b}}{P_b} \ldots\ldots(1) \text{ necessary condition}$$

$$M = P_a X_a + P_b X_b \ldots\ldots(2)\text{Sufficient condition}$$

$$U = 4X_a X_b$$

$$\frac{du}{dx} = MU_{X_b} = 4X_b \ldots\ldots..(3)$$

$$\frac{du}{dy} = MU_{X_b} = 4X_a \ldots\ldots.(4)$$

Put (3) and (4) into (1)

$$\frac{4X_b}{P_a} = \frac{4X_a}{P_b}$$

$$\frac{4X_b}{P_a} = \frac{4X_a}{3}$$

$$12X_b = 4P_a X_a$$

$$\frac{12X_b}{12} = \frac{4P_a X_a}{12}$$

$$X_b = \frac{1}{3}P_a X_a ---------------(5)$$

Put (5) into (2)

$$M = P_a X_a + 3\left(\frac{1}{3}P_a X_a\right)$$

$$M = P_a X_a + P_a X_a$$

$$M = 2P_a X_a \text{-------}(6)$$

$$\frac{M}{2P_a} = \frac{2P_a X_a}{2P_a}$$

$$X_a = \frac{M}{2P_a} \text{-----}(7)$$

$$X_a = \frac{30}{2P_a} \qquad , M=30$$

$X_a = \frac{15}{P_a}$ Demand function of A

b). $TR = P \times Q$

$$MR = \frac{dTR}{dQ} = \frac{d(P \times Q)}{dQ}$$

$$MR = \frac{PdQ}{dQ} + Q\frac{dP}{dQ}$$

$$MR = P + Q\frac{dP}{dQ}$$

Factorizing P

$$MR = P\left[1 + \frac{Q}{P} \times \frac{dP}{dQ}\right]$$

But $E = -\left[\frac{dQ}{dP} \times \frac{P}{Q}\right]$

$$\frac{1}{E} = -\left[\frac{dP}{dQ} \times \frac{Q}{P}\right]$$

$$-\frac{1}{E} = \left[\frac{dP}{dQ} \times \frac{Q}{P}\right]$$

$MR = P\left[1 + \frac{1}{E}\right] = P\left[1 - \frac{1}{E}\right]$ (Because we consider absolute figure)

The elasticity coefficient is inversely related to price level and marginal revenue. The higher the price level, the lower will be the elasticity and the higher will be the marginal revenue (MR) and vice versa

Summary

If demand is inelastic $(Ed < 1)$, an price leads to an increase in total revenue and a decrease in price leads to a fall in total revenue

If the demand is elastic $[Ed > 1]$ an increase in price will result in a decrease of the total revenue while a decrease in price will result in an increase in the total revenue

If the demand has unitary elasticity total revenue is not affected by changes in price, since if Ed=1 then $MR = O$

3) a. use the law of diminishing marginal utility to unquote the phrase “we will only know the worth of water when the well is dry”

b. Provide a proof that the slope of the normal consumer preference curve is equivalent to the ratio of marginal utility

c. Why does the marginal utility diminishes?

d. State three (3) axioms of the cardinalist approach and hence the equi-marginal principle.

d) a. This is an extension of the water-diamond paradox. The fact is that, due to the relative abundance of water, it is relatively cheaper than diamond, thus associated with a greater marginal utility (MU). However when water becomes relatively scarce, it will now become relatively expensive hence, the consumer can only maximize his/her utility by consuming less of water .

b. $U = f(x, y) ---- (1)$

$$du = \frac{du}{dx}dx + \frac{du}{dy}dy --- (2)$$

But $du = 0 --------------- (3)$

$$\frac{du}{dx}dx + \frac{du}{dy}dy = 0 ------------------------(4)$$

$$\frac{du}{dx} = MUx ---- (5)$$

$$\frac{du}{dy} = MUy ------- (6)$$

Put (5) and (6) into (4)

$$MUxdx + MUydy = 0 ------------- (7)$$

$$MUx\frac{dx}{dx} = -MUy\frac{dy}{dx}$$

Divide through by dx and by MUy

$$\frac{MUx}{MUy} = -\frac{MUy}{MUy}\frac{dy}{dx}$$

$$\frac{-dy}{dx} = \frac{MUx}{MUy}$$

$$MRSxy = -\frac{dy}{dx} = \frac{MUx}{MUy}$$

c) Marginal utility diminishes because of the successively less important uses of additional quantities of a commodity.

d)

- Rationality of the consumer
- Disposable income of the consumer is given
- Tastes and preferences are given
- There is perfect competition in the goods market, that is prices of goods are given
- Marginal utility is positive
- Utility is measurable/quantifiable

The equi-marginal principle states that the utility derived from spending an additional unit of money must be the same for all commodities purchased.

That is, $\frac{MUx}{Px} = \frac{MUy}{py} = ---- = \frac{MU_z}{P_z}$

4). Use the demand schedule in the table below to find the consumer surplus if a quantity of six is purchased.

Price	Qty added	Marginal utility(MU)	Total utility(TU)
100	1	100	100
80	2	80	180
65	3	65	243
55	4	55	300
50	5	50	350
45	6	45	395

NB. MU and TU were not given

Solution

How much do we have to pay for six units?

6×45=$270

How much would we be willing to pay for these six units

Total utility $\Rightarrow 395$

Thus the consumer surplus $= \$395 - \$270 = \$125$

Also, Total utility for five units is $\$350$ but we would have to pay 5×50

Therefore consumer surplus=350-250=$100.

4) Assume that there are only 2 commodities and that the total utility function is multiplicative of the form $U = \frac{1}{4} q_x q_y$

The MUs are

$$MU_x = \frac{du}{dq_x} = \frac{1}{4} q_y$$

$$MU_y = \frac{du}{dq_y} = \frac{1}{4} q_x$$

At equilibrium,

$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y}$$

$$\frac{1/4\, q_y}{P_x} = \frac{1/4\, q_x}{P_y}$$

$$\frac{1}{4} P_x q_x = \frac{1}{4} P_y q_y$$

$$P_x q_x = P_y q_y$$

We may derive the demand for commodity x by substituting $q_y p_y$ in the budget line

$$P_x q_x + P_y q_y = M$$

$$P_x q_x + P_x q_x = M$$

$$2 P_x q_x = M$$

$$q_x = \frac{1}{2P_x} M$$

Similarly,

$$q_y = \frac{1}{2P_y} M$$

Thus, the demand for x and y are all inversely related to its own price p_x and p_y respectively and positively related to income M

5) Suppose a consumer's preference between food and clothing can be represented by the utility function $U = \sqrt{XY}$ where X measures the number of units of food and Y the number of units of clothing.

a) show that a consumer with this utility function believes that more is better for each good.

b) show that MU of food and clothing is diminishing

c) show that the indifference curve exhibit diminishing marginal rate of substitution for this utility function

d) is the curve convex ?

Solution

Differentiate

$$MU_x = \frac{du}{dx} = \frac{\sqrt{Y}}{2\sqrt{X}} = \tfrac{1}{2} X^{-\frac{1}{2}} Y^{\frac{1}{2}}$$

$$MU_y = \frac{du}{dy} = \frac{\sqrt{X}}{2\sqrt{Y}} = \tfrac{1}{2} X^{\frac{1}{2}} Y^{-\frac{1}{2}}$$

a) By examining the utility function we can see that U increases whenever X or Y increases. This means that the consumer likes more of each good. "More is better" simple means that the marginal utility is positive.

b) First examine $MU_x = \frac{du}{dx} = \frac{\sqrt{Y}}{2\sqrt{X}}$. As x increases (holding Y constant) MU_x falls, therefore the consumer's MU of food is diminishing. Now examine $MUy = \frac{du}{dy} = \frac{\sqrt{X}}{2\sqrt{Y}}$. As Y increases MU_y falls. Therefore, the MU of clothing is diminishing.

Thus, $U = \sqrt{XY}$ satisfies the assumption that more is better and those marginal utilities are diminishing.

Alternatively

Take first Derivative of U

$$MU_x = \tfrac{1}{2} X^{-\frac{1}{2}} Y^{\frac{1}{2}}$$

Take second derivative of U or first derivative of MU_x

$$\frac{\partial MUx}{\partial x} = -\tfrac{1}{4} X^{-3/2} Y^{1/2} < 0$$ Diminishing

Also,

$$MUy = \tfrac{1}{2} X^{1/2} Y^{-3/2}$$

$$\frac{\partial MUx}{\partial y} = -\tfrac{1}{4} X^{1/2} Y^{-3/2} < 0$$ Diminishing

Thus, the MU of clothing is diminishing and MU of food is diminishing.

c) $MRS_{xy} = \frac{MUx}{MUy} = \frac{\tfrac{1}{2} X^{-\frac{1}{2}} Y^{\frac{1}{2}}}{\tfrac{1}{2} X^{\frac{1}{2}} Y^{-\frac{1}{2}}} = \frac{Y}{X} (Simplify) --------------(1)$

$$\frac{\partial MRSxy}{\partial x} = \frac{X(\partial y / \partial x) - Y}{X^2}$$ (Use Quotient rule)

Since $MRS = -\partial y / \partial x$,

$\partial y / \partial x = -MRS_{xy}$

$$\frac{\partial MRSxy}{\partial x} = \frac{X(-Y/X) - Y}{X^2} = \left(-\frac{2Y}{X^2} < 0 \right)$$

Therefore the indifference curve exhibit diminishing marginal rate of substitution for this utility function.

d) Take second derivative of MRS_{xy} (Use Quotient Rule)

$$\frac{\partial^2 MRS}{\partial x^2} = \frac{X^2\left(-2\frac{\partial y}{\partial x}\right) - (-2Y)(2X)}{X^3}$$

$$= \frac{-2X^2(MRS) + 4XY}{X^3}$$

$$= \frac{-2X^2\left(\frac{Y}{X}\right) + 4XY}{X^3}$$ From equation one (1) MRS=Y/X

$$= \frac{-2XY + 4XY}{X^3}$$

$= \frac{2XY}{X^3} > 0$

Hence convex to the origin (**Key**, for a minimum point the second derivative should be greater than zero - remember quadratic curves)

6) Show whether x is a good or a bad or a neuter

1. $U = \frac{Y}{X}$ b) $U = \frac{X}{Y}$ c. $U = \sqrt{X, Y}$ d) $U = \frac{XY}{Y}$

Solution

$a) U = \frac{Y}{X}$, X is a bad and Y is a good since as X increases U decreases and as Y increases U increases.

b) $U = \frac{X}{Y}$ X is a good and Y is a bad since as X increases U increases and as Y increases U decreases.

c) $U = \sqrt{X, Y}$, both Y and X are goods

d) $U = \frac{XY}{Y}$ Y is a neuter and X is a good since Y has no effect on U

7) Suppose a consumer preferences between two goods that can be represented by the utility function U=Ax$U = Ax^2 + By^2$ where A and B are positive constants. For this utility function $MU_x = 2AX$ and $MUy = 2By$ Show that the MRS_{xy} is increasing

<u>Solution</u>

Since both MU_x and MU_y are positive, indifference curves will be negatively sloped. This means that as X increases along an indifference curve Y must decrease. We know that $MRS_{xy} = MU_x / MUy = 2Ax/(2By) = Ax/By$. As we move along the indifference curve by increasing X and decreasing Y, MRS_{xy} will increase. So we have an increasing MRS of X for Y.

8) Consider the production function whose equation is given by the formula $Q = K^{1/2}L^{1/2}$.

a) What is the equation of the Isoquant corresponding to $Q = 20$

b) For the same production function, what is the equation of the Isoquant corresponding to an arbitrary level of output Q?

Solution

a) The $Q = 20$ Isoquant shows all of the combinations of labour and capital that allow the firm to produce 20 units of output. To find the equation of the 20 unit Isoquant, we solve this equation for K in terms of L $\Rightarrow K = \frac{400}{L}$.This is the equation of the 20 unit Isoquant.

b) $K = \frac{Q^2}{L}$

Eric purchases food (measured by x) and clothing (measured by y) and has the utility function $U(x, y) = xy$. His marginal utilities are $MU_x = y$ and $MUy = x$. He has a monthly income of ¢800. The Price of food is $P_x = 20$, and the price of clothing is $Py = 40$.Find his optimal consumption bundle.

Solution

$P_x X + PyY = I$

$\Rightarrow 20x + 40y = 800 -------------(1)$

Since the optimum is interior the tangency requires

$\frac{MU_x}{MUy} = \frac{P_X}{P_Y}$

$\Rightarrow \frac{y}{x} = \frac{20}{40}$

Or simply

$X = 2y ------------------(2)$

Substituting

$20(2y) + 40y = 800$

$\Rightarrow y = 10$ and $x = 20$

Thus, Eric's optimal basket involves the purchase of 20 units of food and 10 units of clothing each month.

9) Given $U = a\beta + aM$ where a= is any positive constant, M=margarine

$\beta =$ Butter. Show that (they) butter and margarine are substitutes

Solution

$MU_B = a \qquad MU_m = a$

It follows that

$$MRS_{BM} = \frac{MU_B}{MU_M} = \frac{a}{a} = 1$$

$$MRS_{MB} = \frac{MU_M}{MU_B} = \frac{a}{a} = 1$$

⇨ $MRS_{MB} = MRS_{BM}$

Therefore MRS is a constant (not diminishing). Since the $MRS_{M\beta}$ is also 1, the consumer is always willing to give up 1 unit of butter to get another unit of margarine. But $MRS_{\beta M}$ is the slope of the indifference curves the slope of the indifference curves will be constant and equal to -1

10)Prove that the slope of consumer's budget line is $\frac{P_X}{Py}$.

$$M = XP_X + YPy ------------------------(1)$$

$$YPy = M - XP_x ------------------------(2)$$

$$Y = \frac{M}{Py} - \frac{P_X}{Py}X ----------------(3)$$

Equation (3) is a straight line with $-\frac{P_x}{Py} =$ slope and $\frac{M}{Py} =$ intercept

11) Which of the following statements contravenes the laws of preference? Explain

I. "if I choose either of them, I know I would be filled with sorrow."

II. "They are not the same at all, I can't make a choice".

III. "I don't care, just make the choice for me"

Solution

I. violates the axiom of comparison. It indicates inconsistency.

II. violates the axiom of comparison

III. Expresses indifference but does not violate any laws

12) The table below shows kwesi Mensah's Total Utility (TU) schedule for banana and apple. Suppose that the price of banana is GH¢1 and that of apple is GH¢0.50; Kwesi Mensah's income is GH¢6 per time period and all is spent on banana and apple.

Quantity	1	2	3	4	5	6	7	8
TU of Banana	16	30	42	52	60	66	70	72
TU of Apple	11	21	30	38	45	51	56	60

a. State 3 axioms of the Cardinalist approach and hence the equi-marginal principle

b. Find the optimum of Kwesi Mensah

c. Derive Kwesi Mensah's demand curve for banana if the price of banana falls from GH¢1 to GH¢0.50 and the price elasticity of demand over the price ranges.

d. If Mensah consumed 2 units of banana and 4 units of apple, will he be at an optimum? Explain your answer.

Solution

Q	TU_B	TU_A	MU_B	MU_A	$\frac{MU_B}{P_B}$	$\frac{MU_A}{P_A}$	$\frac{MU_{B_1}}{P_B}$ (p=0.50)
1	16	11	16	11	16	22	32
2	30	21	14	10	14	20	28
3	42	30	12	9	**(12)**	18	24
4	52	38	10	8	10	16	20
5	60	45	8	7	8	14	16
6	66	51	6	6	6	**(12)**	**(12)**
7	70	56	4	5	4	10	8
8	72	60	2	4	2	8	4

a. i. Rationality of the consumer

ii. Disposable income of the consumer is given

iii. Tastes and preferences are given

iv. There is perfect competition in the goods market. that is, prices of goods are given

v. marginal utility is positive

vi. Utility is measurable

$$\frac{MU_A}{P_A} = \frac{MU_B}{P_B} = -----\frac{MU_Z}{P_Z} - equi - m\arg inal$$

b. $\frac{MU_B}{P_B} = \frac{MU}{P_A} = \lambda \Rightarrow \frac{MU_B}{P_B} = \frac{MU_A}{P_A} = 12$

$$M = BP_B + AP_A$$

$$6 = B + 0.50A$$

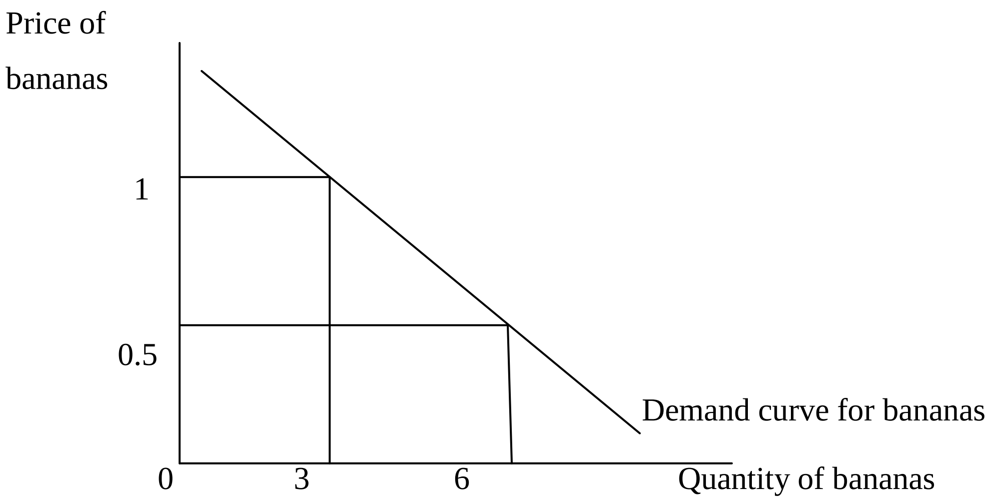
$$6 = 3 + 0.50(6)$$

$$\therefore 6 = 6$$

$\therefore 6 = 0.50B + 0.50A$ when price falls

The optimum of the consumer occurs at the point where he consumes 3 units of bananas and 6 units of apples

c)



$$Ed = \frac{\Delta Q}{\Delta P} \times \left(\frac{p_1 + p_2}{Q_1 + Q_2}\right) = -\frac{3}{0.50} x \left(\frac{1 + 0.50}{3 + 6}\right)$$

$$Ed = \frac{3}{-0.50} \times \frac{1.50}{9} = -\frac{4.5}{4.5}$$

$$\therefore Ed = |1|$$

Thus, the Ed over the given price range is unitary.

d) No, because the consumption of those quantities does not fully exhaust his disposable income.

13) Suppose that the price of bread is GH¢20 and that of butter is GH¢4 while income is GH¢200.

a. Distinguish between a budget line and a budget space.

b. What is the equation of the budget line and what are the coordinates

c. What is the gradient of the budget line?

d. If the price of bread reduces by one-quarter, what will be the new coordinates of the budget line? Will the gradient of the budget line change or remain the same and why?

e. Describe what happens to the coordinates and gradient of the budget line if income increases by 50%

a) $M \geq XP_X + YP_Y -$ Budget space/set

$Y = \frac{M}{P_Y} - \frac{P_x}{P_Y} X -$Budget line

b) 200=20 Bread +4 butter

if no Bread is purchased Bread =0

200=4 Butter

Butter=$\frac{200}{4} = 50$

Coordinates $(0{,}50)$

If No Butter is purchased, Butter =0

Bread $= \frac{200}{20} = 10$

Coordinates $(10{,}0)$

c) 200=20 Bread + 4 Butter

4 Butter=200-20 Bread

Butter=$\frac{200}{4} - \frac{20}{4}$ Bread

Butter = 50-5 Bread

The gradient is -5

Or $\frac{\Delta Butter}{\Delta Bread} = \frac{\beta u_2 - \beta u_1}{Br_2 - Br_1} = \frac{0-50}{10-0} = \frac{-5}{10} = -5$

d) 200=15 Bread + 4Butter

If Bread =0

$\text{Butter} = \frac{200}{4} = 50$

If Butter =0

$\text{Bread} = \frac{200}{15}$

$\text{Bread} = 13.33$

$(0{,}50)(13.33{,}0)$ New coordinates

4 Butter = 200-15 Bread

$\text{Butter} = \frac{200}{4} - \frac{15}{4}\text{Bread}$

The gradient will now de $\frac{15}{4}$, Thus the gradient will change due to the change in price of bread.

e) 100=20Bread+ 4Butter

4 butter = 100-20 Bread

Butter = 25-5 Bread $(0{,}25)(5{,}0)$

The gradient remains sun changed but intercept changes indicating a bodily shift of the budget line.

14) Mention the 3 factors that a rational consumer must consider in deciding how much of a good or goods to buy.

- The income of the consumer
- The price of the commodity
- The value of the commodity of the consumer

16) What information is depicted by a single indifference curve?

It represents all the possible combinations of 2 goods which the consumer in question finds to the equally satisfying

17). Define an inferior good and a normal good. Can a good be both? Why?

An inferior good is defined as one of which an individual purchases less when his or her income rises and more when his or her income falls. A normal good is defined as one of which an individual purchases more when his or her income rises and less when his or her income falls. **Yes,** the same good can be both most goods are normal up to some level of income beyond which they become inferior.

18). Given the data below, compute the MRS of movies for concert and vice versa.

Combination	A	B	C	D
Movies per month	1	2	3	4
Concerts per month	7	5	4	3 ½

Combination	Movies per month	Concerts per months	MRS_{mc}	MRS_{cm}
A	1	7	-	-
B	2	5	2	½
C	3	4	1	1
D	4	3½	½	2