

# Mid-term

Main points; students need to write more detailed answers

1. (9 marks) State whether each of the following statements is true or false. Using appropriate diagrams, explain your response.

i. Two indifference curves can intersect

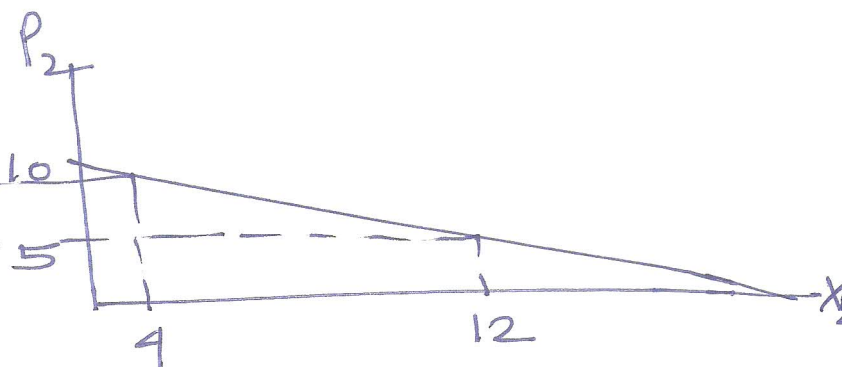
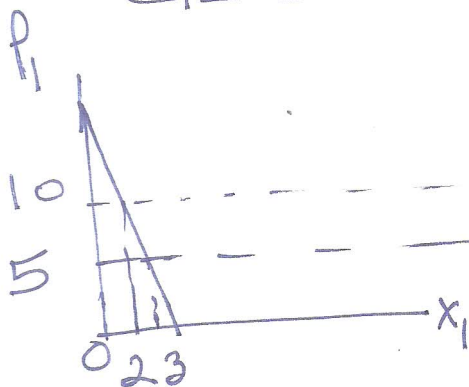
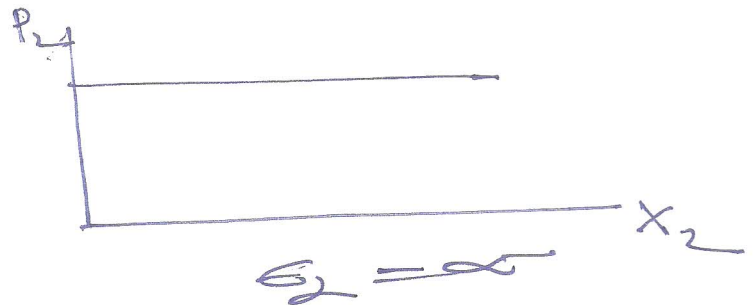
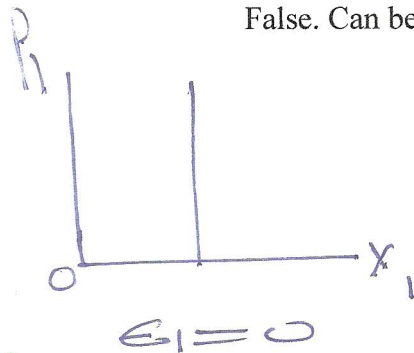
False; Textbook, P.49

ii. Cash gift is at least as good as kind gift

True; P. 87

iii. The flatter the demand curves the lower the elasticity.

False. Can be answered using different diagrams.



(a)

(b)

$$\begin{aligned} E_1 &= \frac{\Delta X_1}{\Delta P_1} \cdot \frac{P_1}{X_1} \\ &= -\frac{1}{5} \cdot \frac{7.5}{2.5} \\ &= -0.6 \end{aligned}$$

$$|E_1| = 0.6$$

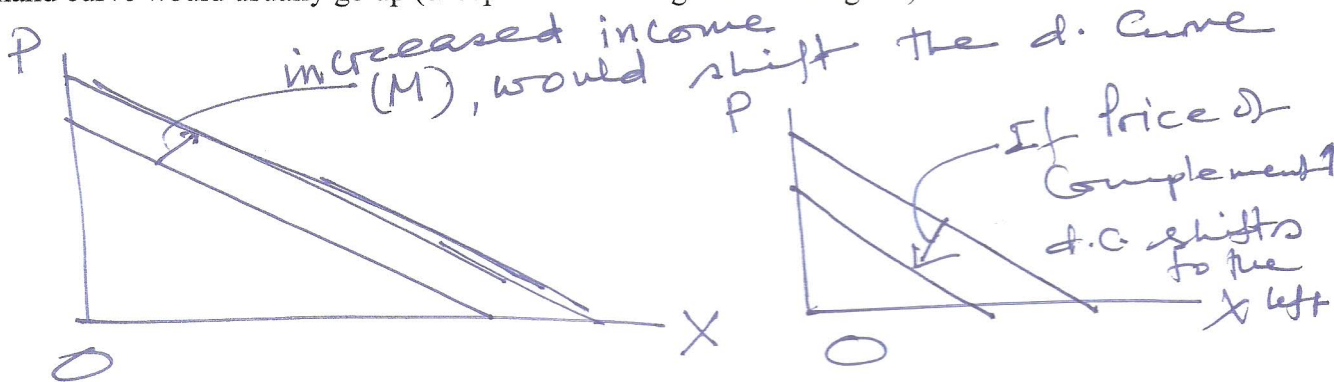
$$\therefore |E_2| > |E_1|$$

$$\begin{aligned} E_2 &= \frac{\Delta X_2}{\Delta P_2} \cdot \frac{P_2}{X_2} \\ &= -\frac{8}{5} \cdot \frac{7.5}{8} \\ &= -1.5 \\ |E_2| &= 1.5 \end{aligned}$$

2. (9 marks)

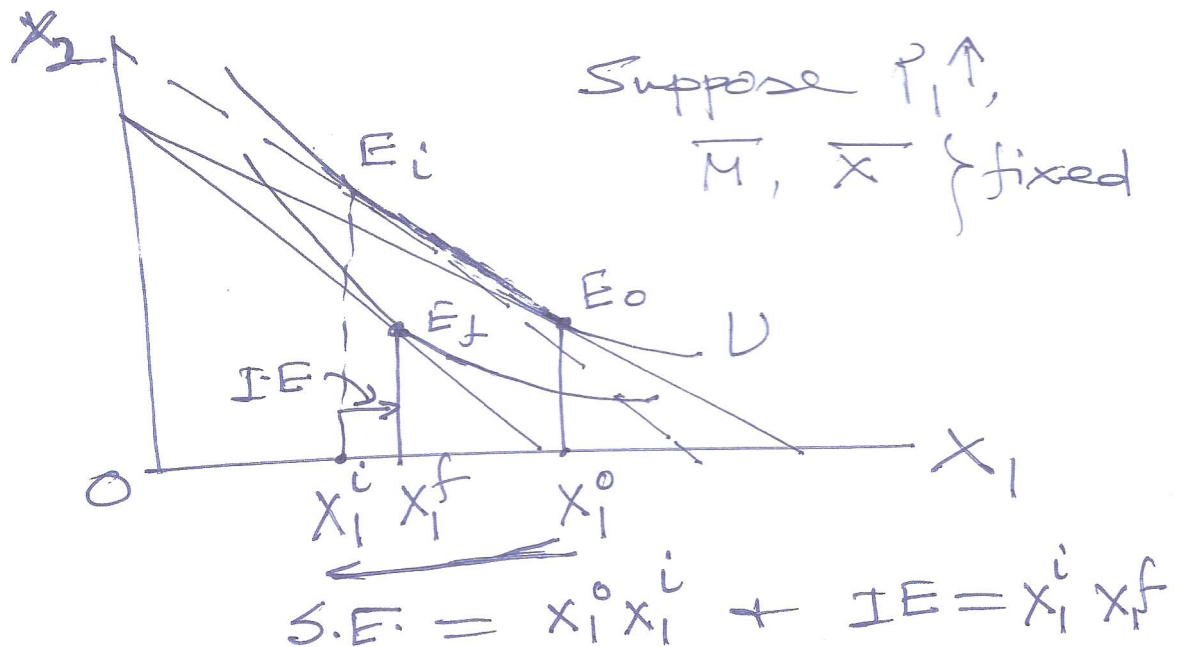
- i. What is the law of demand? Using diagrams, **explain** what would happen to the demand, if there is a change in *other things*.

Other things remaining the same, if price goes down then the quantity demanded would go up. Other things could be prices of substitutes/complements, income etc. The demand curve will shift, if there is a change in other things. For example, if income goes up, the demand curve would usually go up (exception: inferior good/ Giffen good)



- ii. Using diagrams, **explain** the main differences between income effect and substitution effect for an inferior good.

- a. income effect and substitution effect would move in the opposite direction.  
b. SE is bigger than the IE



- iii. Using diagrams, **explain** the main differences between an ordinary demand curve and compensating demand curve.

Ordinary demand curve--maximizes utility given the budget (P.95).

Compensated demand curve--minimizes expenditure given the utility (P.123).

3. (7 marks)

- i. (2) Calculate the MRS of the following utility function:

$$U(X_1, X_2) = X_1 + 3X_2$$

Is the MRS diminishing? Explain.

$$MRS = - \left( \frac{\partial U}{\partial X_1} \right) / \left( \frac{\partial U}{\partial X_2} \right) \propto$$

$$\left| MRS \right| = \frac{MU_{X_1}}{MU_{X_2}} = \frac{1}{3}$$

Thus, the MRS (a constant) is not diminishing.

- ii. (3) Consider the following utility function and the budget equation:

$$U(X_1, X_2) = X_1^{0.25} X_2^{0.75}$$

$$M = P_1 X_1 + P_2 X_2$$

- a. Using Lagrangian, find the demand function of  $X_1$ .

$$L = X_1^{0.25} X_2^{0.75} + \lambda [M - P_1 X_1 - P_2 X_2]$$

By solving the first-order conditions of maximization (see assignment.1 answer key or exercise Ch.4, Q2), the demand for  $X_1$  becomes the following:

$$X_1 = M/4P_1$$

- b. If  $M = \$60$ ,  $P_1 = \$5$  and  $P_2 = \$6$ , find the quantity demanded of  $X_1$ . Suppose  $P_1$  drops to  $\$3$ , find the new quantity demanded, and calculate the price elasticity of demand for this price change.

If  $P_1 = \$5$  then  $X_1 = 3$  units

If  $P_1 = \$3$  then  $X_1 = 5$  units

$$E = \frac{\Delta X}{\Delta P} \cdot \frac{\bar{P}}{\bar{X}}$$

$$= \frac{5-3}{3-5} \cdot \frac{4}{4} = -1$$

$\bar{P}$  = average price  
 $\bar{X}$  = " quantity

$|E| = 1$  or unit elastic.

iii. (2) Suppose that the demand for pencils by a consumer is given by

$$X_d = 25 + 0.4M - 3P + 2P_f$$

Suppose that the values of these variables for the consumer are:

$X = 20$ ,  $M$  (income) = \$20,  $P = \$1$ ,  $P_f$  (fountain pen) = \$2

a. Calculate the cross-price elasticity and income elasticity of demand for pencils.

b. Suppose that the consumer's income decreased by 20%, what will be the percentage change in demand for pencils.

(a) Cross elasticity

$$\begin{aligned} E_{X, P_f} &= \frac{\Delta X}{\Delta P_f} \cdot \frac{P_f}{X} \\ &= +2 \cdot \frac{2}{20} = .2 \end{aligned}$$

Income elasticity

$$\begin{aligned} E_{X, M} &= \frac{\Delta X}{\Delta M} \cdot \frac{M}{X} \\ &= .4 \left( \frac{20}{20} \right) = .4 \end{aligned}$$

(b)

$$E_{X, M} = .4 = \frac{\% \Delta X}{\% \Delta M}$$

$$\% \Delta X = .4 \quad \% \Delta M = .4(20)$$

$$\therefore \% \Delta X = 8\%$$

For a 20% drop in income, demand for pencils will drop by 8%.