

Assignment.1

Main Points

P₁/4

Students are required to write more detailed answers.

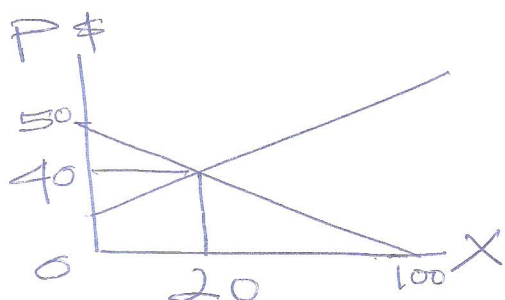
1. a.

At equilibrium,

$$X_S = X_D$$

$$-60 + 2P = 100 - 2P, \text{ or } 4P = 160$$

$$\therefore P = \$40, X = 20 \text{ units}$$



b. Suppose $P = \$45$

$$\text{Then } X_D = 100 - 90 = 10 \text{ units}$$

$$X_S = -60 + 90 = 30 "$$

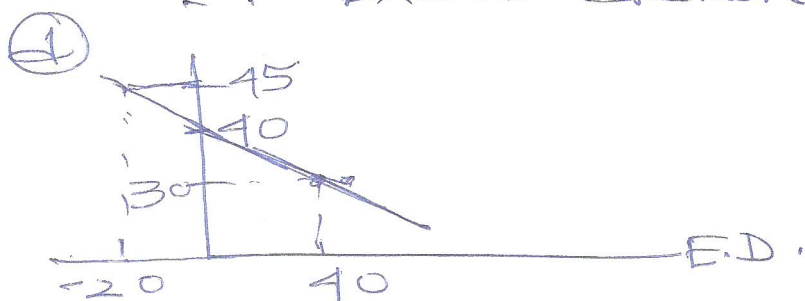
$$\therefore \text{Excess demand} = \frac{30 - 10}{1} = 20 \text{ units}$$

© Say $P = \$30$

$$\text{Then } X_D = 100 - 60 = 40 \text{ units}$$

$$X_S = -60 + 60 = 0 "$$

$$\therefore \text{Excess demand} = 40 "$$



P2/4

2.

a. Two indifference curves can intersect.

False, see the text book page, 49

b. Marginal rate of substitution is always diminishing

False, see the text book page, 59 (example: perfect substitutes/complements)

c. Cash gift usually is the best gift.

True, see the text book page, 87

3. (3 marks) Suppose that income is M , and prices are P_1 and P_2 , and consider the following utility function:

$$U = x_1^{0.8} x_2^{0.2}$$

a. Calculate the MRS. Is it diminishing? Explain.

b. Using Lagrangian, derive the ordinary demand functions of X_1 and X_2 .

c. Suppose $M = \$100$, and prices are $P_1 = \$20$ and $P_2 = \$20$; calculate the utility maximizing quantities of X_1 and X_2 . If price of good 1 drops to $\$10$, what would be the demand for X_1 . Using this information, draw a demand curve for X_1 .

$$② \quad MRS_{x_1, x_2} = - \frac{MU_{x_1}}{MU_{x_2}}$$

$$MU_{x_1} = \frac{\partial U}{\partial x_1} = 0.8 x_1^{-0.2} x_2^{0.2}$$

$$MU_{x_2} = \frac{\partial U}{\partial x_2} = 0.2 x_1^{0.8} x_2^{-0.8}$$

$$\therefore MRS = - \frac{0.8 x_1^{-0.2} x_2^{0.2}}{0.2 x_1^{0.8} x_2^{-0.8}}$$

$$= -4 \frac{x_2}{x_1} \quad \text{or} \quad MRS = 4 \frac{x_2}{x_1}$$

The MRS is diminishing because as x_1 goes up the ratio $\left(\frac{x_2}{x_1}\right)$ would fall

(b) Lagrangian,

P3/4

F.O.C. $L = x_1^{.8} x_2^{.2} + \lambda [M - P_1 x_1 - P_2 x_2] \quad \text{--- (i)}$

$$\frac{\partial L}{\partial x_1} = .8 x_1^{-.2} x_2^{.2} - \lambda P_1 = 0 \quad \text{--- (ii)}$$

$$\frac{\partial L}{\partial x_2} = .2 x_1^{.8} x_2^{-.8} - \lambda P_2 = 0 \quad \text{--- (iii)}$$

$$\frac{\partial L}{\partial \lambda} = M - P_1 x_1 - P_2 x_2 = 0 \quad \text{--- (iv)}$$

From (ii) $\lambda P_1 = .8 x_1^{-.2} x_2^{.2}$

$$\text{or } \lambda = \frac{.8 x_1^{-.2} x_2^{.2}}{P_1}$$

From (iii) $\lambda P_2 = .2 x_1^{.8} x_2^{-.8}$

$$\therefore \lambda = \frac{.2 x_1^{.8} x_2^{-.8}}{P_2}$$

$$\therefore \lambda = \frac{.8 x_1^{-.2} x_2^{.2}}{P_1} = \frac{.2 x_1^{.8} x_2^{-.8}}{P_2}$$

$$\therefore 4 P_2 x_2 = P_1 x_1$$

From (iv) $P_1 x_1 + P_2 x_2 = M$

$$4 P_2 x_2 + P_2 x_2 = M$$

$$\therefore x_2^* = \frac{1}{5} \frac{M}{P_2}; \text{ demand function of } x_2$$

$$\text{Similarly } x_1^* = \frac{4}{5} \frac{M}{P_1}; \quad \text{'' '' '' } x_1$$

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$\frac{P_1}{4/4}$

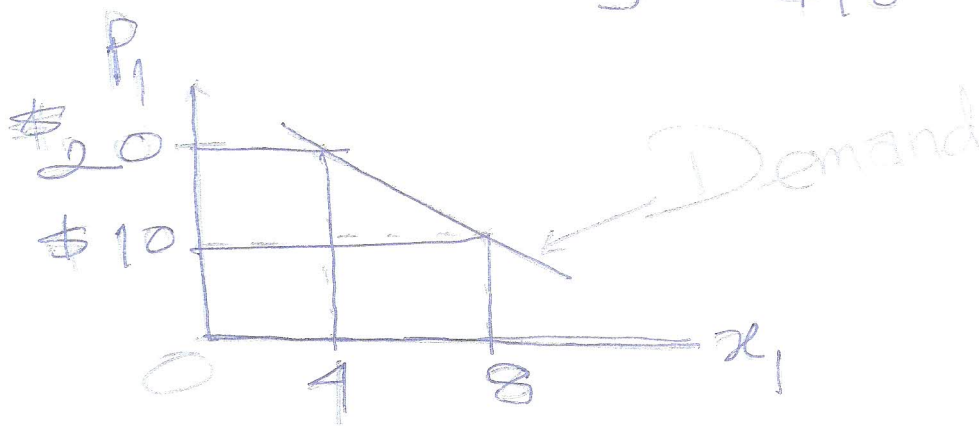
$$x_1^* = \frac{4}{5} \cdot \frac{M}{P_1}$$

$$= \frac{4}{5} \cdot \frac{\$100}{\$20} = 4 \text{ units}$$

$$x_2^* = \frac{1}{5} \cdot \frac{\$100}{\$20} = 1 \text{ unit}$$

If $P_1 = \$10$, then

$$x_1^* = \frac{4}{5} \cdot \frac{\$100}{\$10} = 8 \text{ units}$$



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