

PRINCIPLES OF MICROECONOMICS (ECON 1101 SECTION 056)

ASSIGNMENT #2

Answer Key

1. (12 points) The price of a capacitor increases from 70¢ each to 80¢ each while preferences remain the same. Use the data from the table to answer the questions or complete the tasks in (a)-(d).

Price of capacitors	Quantity of capacitors demanded	Quantity of thyristors demanded
70	31,500	5,000
80	28,500	4,600

- (a) Calculate the price elasticity of demand for capacitors.

$$E_d = \frac{P/\Delta Q}{Q/\Delta P} = \frac{\frac{70+80}{2} |28,500-31,500|}{\frac{31,500+28,500}{2} |80-70|} = \frac{75 \cdot 3,000}{30,000 \cdot 10} = 0.75$$

- (b) Is the demand for capacitors elastic, unit-elastic, or inelastic in this price range? **Inelastic**  
(c) Calculate the cross price elasticity between capacitors and thyristors.

$$E_c = \frac{P_c \cdot \Delta Q_T}{Q_T \cdot \Delta P_c} = \frac{\frac{70+80}{2} (4,600-5,000)}{\frac{5,000+4,600}{2} (80-70)} = \frac{-75(400)}{4,800 \cdot 10} = -0.625$$

- (d) Are these goods complements, substitutes, or not related? Why? **Complements; the cross elasticity is negative, or demand for thyristors decreases when capacitor prices increase.**

2. (20 points) The demand in the market for ceiling fans is described by

$$P(Q) = 200 - 2Q.$$

(a) Find the quantity demanded as a function of price. (That is, rewrite  $P(Q)=200-2Q$  as

$$Q(P)=\dots)$$

$$P=200-2Q$$

$$P+2Q=200$$

$$2Q=200-P$$

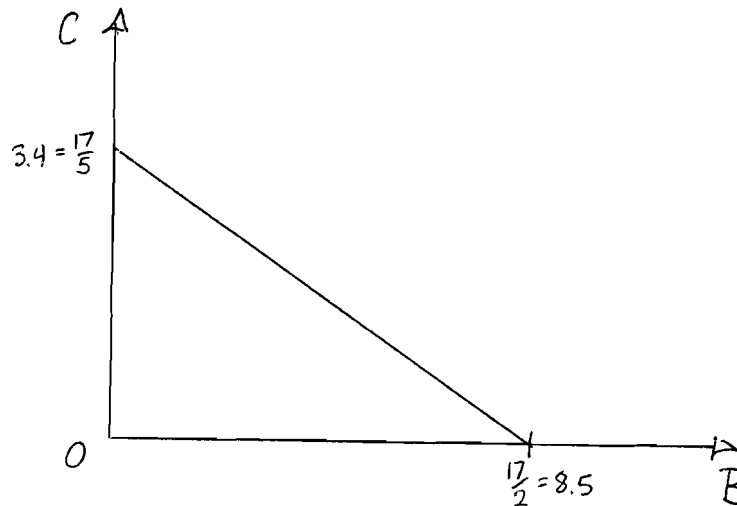
$$Q(P)=100-P/2$$

(b) Complete the table. Calculate elasticities using the midpoint rule.

Quantity demanded	Price	Price elasticity on the interval
0	200	$\frac{180 \cdot 20}{10 \cdot 40} = 9$
20	$200 - 2 \cdot 20 = 160$	$\frac{140 \cdot 20}{30 \cdot 40} \approx 2.3$
40	$200 - 2 \cdot 40 = 120$	$\frac{100 \cdot 20}{50 \cdot 40} = 1$
60	$200 - 2 \cdot 60 = 80$	$\frac{60 \cdot 20}{70 \cdot 40} \approx .429$
80	$200 - 2 \cdot 80 = 40$	$\frac{20 \cdot 20}{90 \cdot 40} \approx .111$
100	$200 - 2 \cdot 100 = 0$	

3. (12 points) Marie spends all her money on two goods: bread (b) and cake (c). The price of bread is 2, the price of cake is 5, and Marie receives a daily income of 17. Marie has a utility function given by  $U(b,c) = b \cdot c + 4c$ .

(a) Graph Marie's budget line. Label everything and give numerical values for the intercepts.



(b) For each of the following consumption bundles indicate whether or not Marie can afford it. Then rank the affordable bundles according to Marie's preferences.

b	c	Cost and affordability	Utility if affordable	Rank
0	3	15, affordable	12	2 <sup>nd</sup> (tied)
1	4	22, not affordable	-	
2	2	14, affordable	12	2 <sup>nd</sup> (tied)
2	3	19, not affordable	-	
3	2	16, affordable	14	1 <sup>st</sup>
4	2	18, not affordable	-	
5	1	15, affordable	9	5 <sup>th</sup>
6	1	17, affordable	10	4 <sup>th</sup>
9	0	18, not affordable	-	

4. (12 points) A consumer buys 17 kg/yr of rice when income is \$40,000 and the price of rice is \$1.30/kg. When the consumer's income rises to \$45,000, the consumer buys 15 kg/yr.

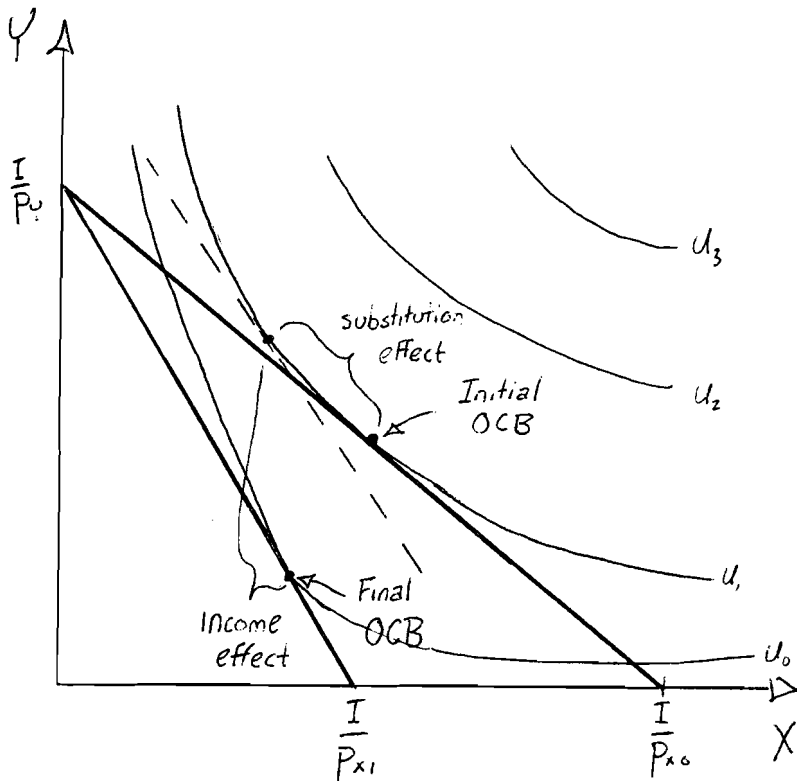
(a) Is rice a normal or inferior good? Why?

**Rice is an inferior good for this consumer, because the consumer buys less when he has a higher income.**

(b) Calculate the income elasticity of demand for rice.

$$E_y = \frac{I \Delta Q}{Q \Delta I} = \frac{\frac{40,000 + 45,000}{2} (15 \frac{\text{kg}}{\text{yr}} - 17 \frac{\text{kg}}{\text{yr}})}{\frac{15 \frac{\text{kg}}{\text{yr}} + 17 \frac{\text{kg}}{\text{yr}}}{2} (45,000 - 40,000)} = \frac{-42,500 \cdot 2}{165,000} = -1.0625$$

5. (8 points) Suppose there are two goods, X and Y, where X is inferior and Y is normal. Suppose the price of X increases. Draw a graph in X-Y space and mark the optimal consumption bundles from before and after the price change. Graphically show the income and substitution effects, being clear to label each effect.



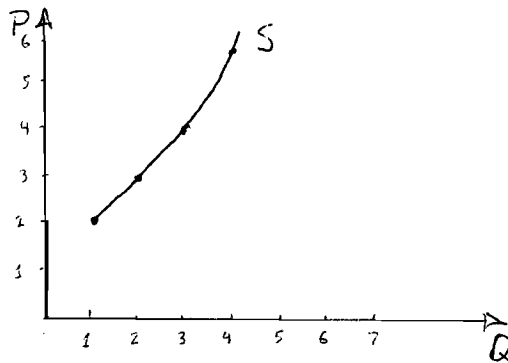
6. (24 points) A firm sells in a perfectly competitive market. The market price for the good is 4 per unit.

(a) Complete the following table:

Quantity	Fixed Cost	Variable Cost	Total Cost	Average Variable Cost	Average Total Cost	Marginal Cost	Profit
0	4	0	4	---	---	---	-4
1	4	2	6	2	6	2	-2
2	4	5	9	$5/2=2.5$	$9/2=4.5$	3	-1
3	4	9	13	3	$13/3\approx 4.33$	4	-1
4	4	15	19	$15/4=3.75$	$19/4=4.75$	6	-3
5	4	23	27	$23/5=4.6$	5.4	8	-7
6	4	32	36	$32/6\approx 5.33$	6	9	-8

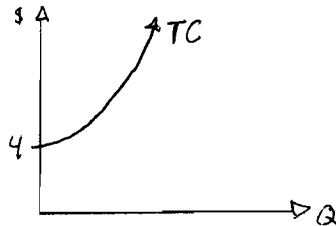
(b) Use the profit column to find the profit maximizing quantity. **Q=3 (or 2)**

(c) Graph the firm's supply curve.



7. (12 points) A firm faces costs given by the total cost function  $TC(Q) = Q^2 + 4$ . The industry is perfectly competitive, and the market price is 18.

(a) Graph the cost function.



(b) What is the fixed cost faced by this firm? **4**

(c) Does the production function, which this cost curve represents, exhibit diminishing marginal product of its inputs? Explain why or why not.

**Yes, the cost function is concave up (or convex), so as quantity increases each additional unit is more expensive to produce. This must be because more of the variable inputs are needed to produce the additional unit, which is what is meant by diminishing marginal product.**

(d) Find the firm's total revenue as a function of Q.

$$TR = 18Q$$

(e) Find the firm's profit as a function of Q.

$$\Pi = TR - TC = Q^2 + 4 - 18Q$$