SMU SINGAPORE MANAGEMENT UNIVERSITY

Economics & Society
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Practice Set 3

Cost, Supply & Competitive Markets

This set contains problems for your own practice. Do not just read the provided solutions — try to solve the problems first, and use the solutions only when you are stuck. Reading solutions without attempting the problems first has the same value for your preparation as watching someone else run a marathon and then expecting to be able to run it yourself. If you are unable to comprehend the solution of a problem even after reading the instructional answer key, you have most likely missed the relevant part of the material underlying this problem. Direct any questions about this problem set to your section's teaching assistant.

1. Fill in the following table:

q	TC	VC	FC	MC
0	___	___	60	-
1	___	10	___	___
2	90	___	___	___
3	___	___	___	20
4	___	80	___	___
5	180	___	___	___
6	___	___	___	50

2. Rika operates a lemonade stand and sells freshly squeezed lemonade for $3 per cup on Sundays from 4pm to 6pm. Each cup requires $2 worth of raw materials. If Rika were not operating the stand, she could wash her dad's car and receive $10 for her work.
   (a) How many cups of lemonade should Rika sell this Sunday to make zero economic profit?
   (b) How much income would she pocket this Sunday if she sold the number of cups you calculated in (a)?
   (c) Why is the economic profit a different amount than the income Rika brings home?
   (d) If she knew that this Sunday she would make zero economic profit, would she prefer to wash her dad's car instead of selling lemonade?
   (e) How does her economic profit compare to the income she would bring home if she sold 12 cups of lemonade?
   (f) Is it possible for Rika to have economic losses but still pocket some money from the lemonade stand?

3. Carlos is a Spanish tutor charging 30 euros per hour. At this price, he can find plenty of students. Recently, he also started an online store selling handmade necklaces. The market for necklaces is perfectly competitive with a price of 20 euros per necklace. It takes Carlos 10 minutes to make a necklace, and the marginal cost of materials is given below.

Necklaces per day	1	2	3	4	5	6	7	8	9	10
MC of materials	20	10	3	1	2	4	7	11	18	28

   Find the optimal number of necklaces he should produce per day.

4. Explain why a PC firm will not shut down in the S-R when $AVC < p < AC$.

5. Which of the following formulas would yield the profit of a firm?
   (1) $\Pi = R - C$, (2) $\Pi = (p - AC)q$, (3) $\Pi = (p - AVC)q - FC$.

6. Explain why when MC is constant, then $AVC = MC$.

7. [Optional] Explain why MC crosses AC at its minimum.

Answer Key

1. Fill in the following table:

q	TC	VC	FC	MC
0	*60 + 0 = 60*	*0*	60	-
1	*60 + 10 = 70*	10	*60*	*70 – 60 = 10*
2	90	*90 – 60 = 30*	*60*	*90 – 70 = 20*
3	*90 + 20 = 110*	*110 – 60 = 50*	*60*	20
4	*80 + 60 = 140*	80	*60*	*140 – 110 = 30*
5	180	*180 – 60 = 120*	*60*	*180 – 140 = 40*
6	*180 + 50 = 230*	*230 – 60 = 170*	*60*	50

2. Rika operates a lemonade stand and sells freshly squeezed lemonade for $3 per cup on Sundays from 4pm to 6pm. Each cup requires $2 worth of raw materials. If Rika were not operating the stand, she could wash her dad's car and receive $10 for her work.

   (a) How many cups of lemonade should Rika sell this Sunday to make zero economic profit?

   Rika's economic profit is zero when her revenue exactly covers all her costs. Her revenue is $\$3 \cdot q$*, where* q *is the number of cups. The cost of raw materials is* $\$2 \cdot q$*, but we must also account for the opportunity cost of her time. From her next best alternative — washing her dad's car — we estimate this at $10. Her total cost is therefore* $\$10 + \$2 \cdot q$*. Economic profit is zero when* $\$3 \cdot q = \$10 + \$2 \cdot q$*, or* $q = 10$ *cups.*

   (b) How much income would she pocket this Sunday if she sold the number of cups you calculated in (a)?

   If she sold 10 cups, her revenue would be $\$3 \cdot 10 = \$30$*, her explicit cost would be* $\$2 \cdot 10 = \$20$*, and she would pocket* $\$30 - \$20 = \$10$*. That is, she pockets the opportunity value of her labor.*

   (c) Why is the economic profit a different amount than the income Rika brings home?

   Economic profit is the revenue remaining after all costs have been covered, including opportunity costs. The $10 Rika brings home is not profit — it is simply remuneration for the time she spent selling lemonade. Economic profit measures earnings relative to the next best alternative, while the money she brings home (accounting profit) measure earnings relative to zero.

   (d) If she knew that this Sunday she would make zero economic profit, would she prefer to wash her dad's car instead of selling lemonade?

   She would not. Zero economic profit means she earns exactly as much as she would from her next best alternative. She has no economic reason to switch to washing her dad's car.

   (e) How does her economic profit compare to the income she would bring home if she sold 12 cups of lemonade?

   If Rika sold 12 cups, her revenue would be $\$3 \cdot 12 = \$36$*, her cost would be* $\$10 + \$2 \cdot 12 = \$34$*, and she would bring home $12, from which: $10 would be the value (opportunity cost) of her labor; and $2 would be the economic profit of the lemonade stand enterprise.*

   (f) Is it possible for Rika to have economic losses but still pocket some money from the lemonade stand?

   It is possible. If Rika sold 5 cups, her revenue would be $\$3 \cdot 5 = \$15$*, her cost would be* $\$10 + \$2 \cdot 5 = \$20$*, and her economic profit would be* $\$15 - \$20 = -\$5$*. Yet, she would bring home $5, half of the opportunity cost of her labor.*

3. Carlos is a Spanish tutor charging 30 euros per hour. At this price, he can find plenty of students. Recently, he also started an online store selling handmade necklaces. The market for necklaces is perfectly competitive with a price of 20 euros per necklace. It takes Carlos 10 minutes to make a necklace, and the marginal cost of materials is given below.

Necklaces per day	1	2	3	4	5	6	7	8	9	10
MC of materials	20	10	3	1	2	4	7	11	18	28

Find the optimal number of necklaces he should produce per day.

His overall MC must include both the cost of materials and his labor costs. Carlos's hourly rate is 30 euros. He can make 6 necklaces per hour, so his labor cost per necklace is 30/6 = 5 euros. The MC of his labor is constant at 5 euros per necklace.

Necklaces per day	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
MC of labor	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
MC of materials	*20*	*10*	*3*	*1*	*2*	*4*	*7*	*11*	*18*	*28*
MC	*25*	*15*	*8*	*6*	*7*	*9*	*12*	*16*	*23*	*33*
C	*25*	*40*	*48*	*54*	*61*	*70*	*82*	*98*	*121*	*154*
R	*20*	*40*	*60*	*80*	*100*	*120*	*140*	*160*	*180*	*200*
Π	*-5*	*0*	*12*	*26*	*39*	*50*	*58*	***62***	*59*	*46.*

Carlos maximizes profit where $p = MC$. Since $MC = p = 20$ occurs between $q = 8$ and $q = 9$, we must compare profits at both quantities.

For 8 necklaces:

Revenue = 8 · 20 = 160 euros.

Cost = 25 + 15 + 8 + 6 + 7 + 9 + 12 + 16 = 98 euros.

Profit = 160 − 98 = 62 euros.

For 9 necklaces:

Revenue = 9 · 20 = 180 euros.

Cost = 98 + 23 = 121 euros.

Profit = 180 − 121 = 59 euros.

*Maximum profit occurs at **8** necklaces.*

4. Explain why a PC firm will not shut down in the S-R when $AVC < p < AC$.

When $p < AC$ the firm is losing money, but shutting down does not make those losses disappear — the firm still owes its fixed costs regardless. The question is therefore not "should the firm lose money?" but "how much should it lose?" If the firm shuts down, it loses the entire FC. If it continues operating and $AVC < p$, each unit sold contributes something toward covering FC, reducing the total loss. Operating is therefore the lesser evil in the short run. Once the short run ends and fixed costs become avoidable, this changes — if $p < LAC$, the firm shuts down permanently.

5. Which of the following formulas would yield the profit of a firm?

(1) $\Pi = R - C$, (2) $\Pi = (p - AC)q$, (3) $\Pi = (p - AVC)q - FC$.

All three formulas equivalently yield the profit of a firm. Formula (1) subtracts total cost from total revenue — the definition of profit. Formula (2) multiplies profit per unit $(p - AC)$ by the number of units q. Formula (3) achieves the same as (2) but subtracts FC separately. Use whichever is most convenient given the information available.

6. Explain why when MC is constant, then $AVC = MC$.

   A constant MC means that every unit costs the same to produce, so the average variable cost must equal that constant as well. For instance, if $MC = \$10$ for every unit, then $AVC = \$10$ too. Moreover, if $FC = 0$, then $AVC = AC$. Consequently, when MC is constant and $FC = 0$, $AC = AVC = MC$. This is a useful property — it allows us to determine AC or AVC when only MC is given.

7. [Optional] Explain why MC crosses AC at its minimum.

   When $MC < AC$, AC is decreasing, because each additional unit costs less than the current average, pulling the average down. On the contrary, when $MC > AC$, AC is increasing, because each additional unit costs more than the current average, pushing the average up. Therefore, AC decreases when MC is below it and increases when MC is above it, which entails that it reaches its minimum exactly where MC crosses it. The same logic applies to why MC crosses AVC at its minimum.

Please report any typos, mistakes, or suggestions for improvement to kmarinakis@smu.edu.sg.