Worked Solutions 4

Lectures 7 and 8.

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Unit 4: Solutions

Exercise 1

The following lists describe the four available production plans for five different firms. Positive numbers indicate amounts of an output, while negative numbers amounts of inputs. Which firms have only efficient production plans?

	Plan 1	Plan 2	Plan 3	Plan 4
Firm A	(0,0,0)	(1, –567, –4)	(3, –31, –196)	(3, –31, –195)
Firm B	(1, –6, –9)	(2, –6, –9)	(2, –7, –8)	(2, –9, –1)
Firm C	(1,–2, –3)	(2, –4, –6)	(3, –6, –9)	(4, –8, –12)
Firm D	(1, 2, –3, –4)	(2, 4, –6, –8)	(1, 3, –3, –4)	
Firm E	(1, 2, –3, –4)	(2, 4, –6, –8)	(1, 3, –4, –4)	

Answers

If all the production plans are efficient, then it should not be possible to get more output from the given inputs and it should not be possible to produce that output using strictly less of one input.

Firm A   Not all efficient. Plan 3 can be replaced by Plan 4, to produce the same output using less of the last input.

Firm B   Not all efficient. Plan 1 can be replaced by the second, using the same inputs to produce 2 rather than 1 units of output.

Firm C   All efficient.

Firm D   Not all efficient. Plan 1 can be replaced by Plan 3, resulting in more of the second output with the same inputs.

Firm E   All efficient.

Exercise 2

List the major productive inputs used in your firm or organisation. To what extent can these inputs be substituted for one another?

Answers

Depends on your organisation.

For my organisation (a university), the main inputs are teaching faculty, administration and capital inputs such as buildings, computers and libraries.

There are some substitution possibilities between capital (computers, libraries) and teaching faculty and administrators and teachers can substitute workloads between themselves.

Exercise 3

Think again about the major inputs your firm or organisation uses. Are they fixed or variable? What costs are incurred in varying their quantity rapidly?

Answers

Again this depends on your organisation. For the case of universities, faculty and administration clearly more variable than buildings and libraries.

Apply the concept of short-run and long-run to the costs of production in your particular business. If you are in a service industry, think about the nature of any training you may have had and whether it is transferable to other jobs. How long is the long run? The answer is how long it would take to sell a particular factor of production.

Exercise 4

Provide examples of firms where your intuition suggests there are likely to be increasing, decreasing, or constant returns to scale. What are the returns to scale within the industry in which you operate?

Answers

Industries with increasing returns include those with large fixed capital costs that can be averaged down with increased output and low variable costs. Examples include steel mills, car manufacturing. Other examples occur because of the 'geometry' of their technologies (pipelines, transport, hydroelectric power).

For decreasing returns, perhaps agriculture (land is a difficult factor to 'scale up') and complex industries where incentive/management issues bind beyond a certain scale, research activities sometimes tend to be more efficient in smaller firms, partnerships (agency problems develop, see later units).

Constant returns – any process that can be replicated. Simple production processes such as selling icecreams from a van. Double the number of sellers, vans and icecreams and twice the capacity to sell arises.

Exercise 5

Explain why Andy Capp (in the cartoon) could use some help with applying the concept of sunk costs.
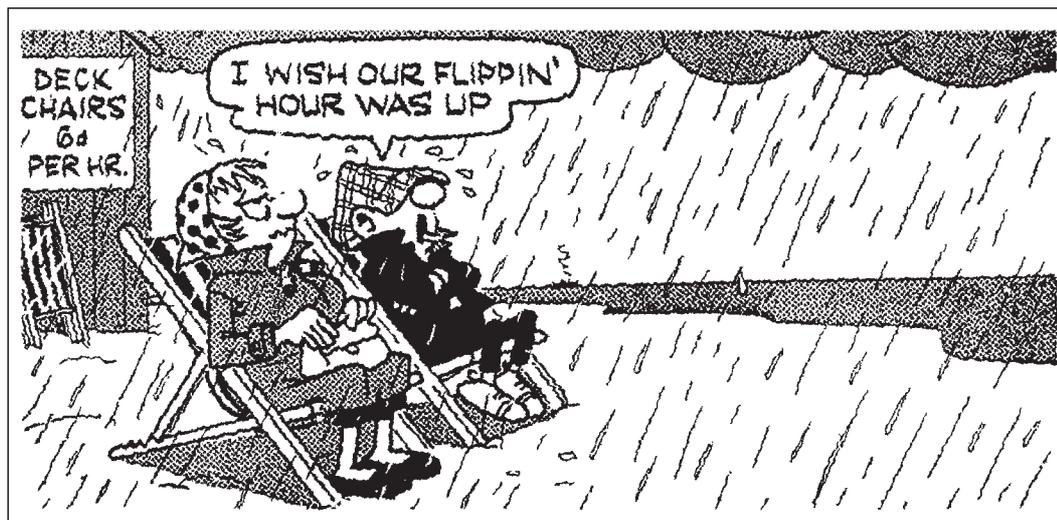
Answer

Since they have already spent the money on the deck chairs, they should get out of the rain because remaining in the rain would not increase their utility or get their money back. (An aspect of this cartoon I dislike is the implication that Andy is a screwball. The inability to give up on sunk costs, to abandon lost causes, to admit past error, and to let bygones be bygones is a deep psychological need that needs to be aggressively countered).

Alternatively, suppose a firm spends a great deal of money on an advertising campaign for a new product and the product doesn't sell. Should the firm spend even more? Of course there may be other reasons why it might persist with the product, but it should not spend more money on advertising just to try and justify the initial outlay. The old saying 'Don't throw good money after bad' applies here. Look ahead, don't look back. Firms should always ignore sunk costs, while taking opportunity cost into account, but often they do not.

Finally, suppose a firm has produced 1,000 units of a new output at a cost of $150,000. The market for this new output is much weaker than expected, and customers will only pay a maximum of $95 per unit of this product. Should the firm hold out for a price over $150 on the grounds that, if it sells output now at $95 it will crystallise a loss of $55,000, or should it cut its losses and sell for $95? If market conditions are expected to remain the same, the output should be sold for $95. The costs that have been incurred are sunk and the firm should do the best it can to ignore such costs. The fact that they have been incurred is an irrelevancy for current selling decisions.

Figure 4.12 *The sunk cost idea and Andy Capp*

Source: The Sun Herald, illustration by Smyth.

Exercise 6

Consider two competitive industries, both of which produce identical outputs. Suppose one consists of firms with U-shaped marginal and average cost curves, while the other consists of firms with L-shaped cost curves. How will firm profitability vary with the scale of firm output in these industries?

Answer

The industry with U-shaped costs will have mid-sized firms profitable while small and large firms will be less profitable. With L-shaped costs, larger firms most profitable.

Exercise 7

Give examples of economies of scope and learning in your own firm or in other firms that you are familiar with. How do economies of scale differ from economies due to learning?

Answers

Depends on your industry. Again taking my case (universities), there are economies of scope between two outputs – teaching and doing research.

A useful question, since these are often confused. Economies of scale relate to reduced costs from producing more at a given point of time. Learning refers to cost savings that occur due to accumulating experience over time. In simple capital-intensive projects, one is likely to see economies of scale without economies of learning. In complex labour-intensive activities (eg, the professions), there may be substantial learning effects with no economies of scale.

Exercise 8

1. Suppose your niece decides to start a gardening business. She has no credit history, so she finds it difficult to borrow money from a bank. She needs $10,000 to start up the business. You have $10,000 to lend. She offers you a 5 per cent rate of return per annum if you invest the $10,000. What other information do you need before you make your decision? (You can assume that she's done her market research well and that this is an accurate assessment of your earnings from the project.)

2. Now suppose your bank offers you a fixed-term deposit of 5.5 per cent and this is the highest return of any investment possibility. If you were to choose between the bank's offer and your niece's project, which would you choose? Why?

3. Suppose your niece was not taking her own time into consideration. Would she be assessing her business properly? How should your niece assess the value of her own time in the business?

Answers

1. The relevant information, here, is the opportunity cost of the $10,000 (ie, the next best alternative use of the money). Assuming the niece has done her homework, what the lender would need to know is how much she could earn if she put her or his money in a safe alternative. If more than five per cent could be earned elsewhere, then the gardening business is not a good place to put the money, at least on financial grounds.

2. If you were making your decision solely on a monetary basis, you would choose the bank's offer. If you choose to help your niece, you would be making her a gift of $500 a year ($10,000 times 0.005). You may be willing to do this, but it is still a gift. Of course, people make decisions on the basis of the desire to help family or because an investment 'feels' right, but the economic principle of opportunity cost forces you to explicitly recognise that.

3. If the niece was a fully qualified accountant, she might be able to make more as an accountant than from a gardening business. Regardless of what her training is, though, she needs to count the cost of her own time as a cost to her own business, valued at whatever her alternative best employment opportunity is (even if that is the dole).

Exercise 9

A farmer is taking on casual workers to pick fruit in his orchard. The trees on the southern side of the orchard bear most fruit and the productivity of workers there is highest. Subsequent casual workers are slotted towards the northern side of the orchard where yields and productivity are lower. The farmer is observant and notices that the fruit-picking productivity of the kth worker employed is 10,000/k fruit per day, each of which can be sold directly for 10¢ a piece at the local fruit marketing board. The going daily rate for casual fruit pickers is $93 per day. How many casual fruit pickers should he employ? (Hint: what is the value of the marginal product? What is the marginal revenue?)

Answer

The kth worker earns $0.10 \times 10,000/k$ per day and costs $93, so workers should be employed until these revenues and costs equate, namely when $1000/k = 93$, or $k = 10$. If an eleventh worker is hired, the value of her marginal product will be $\frac{\$1000}{11} = 90.91$, less than the $93 she costs the farmer.

Exercise 10

Your firm sells surfboards for $500 each in a competitive industry. Your company is currently selling four surfboards per week and is considering increasing output to five per week. Using the data in Table 4.2, determine the profit-maximising output level for this firm and indicate this with an asterisk.

Table 4.2 *Output and marginal cost*

Number of surfboards	Minimum total production cost
0	0
1	175
2	400
3	635
4	975
5	1,475
6	2,075
7	2,775

Answer

Profit does not increase between 4th and 5th units. Profit falls for 6th unit. Production costs for 6th unit are better spent elsewhere.

Exercise 11

A competitive jellybean industry has many firms, each producing 1,000,000 jellybeans per day. The jellybeans sell for 0.052 cents each. What is the marginal cost of a jellybean?

Answer

Since the industry is competitive, output is increased to the point where p = MC so, here marginal cost must be 0.052 cents.

Exercise 12

Given the data listed below, should Continental run an extra daily flight from City X to City Y?

The Data

Fully allocated fixed costs of flight	$4,500
Out-of-pocket costs of this flight	$2,000
Gross returns from flight	$3,100

Answer

Yes, run the flight. The gross returns exceed the 'fully out-of-pocket' costs.

Exercise 13

Explain why firms continue producing output in the short run even though they are making losses.

Answer

Because they cannot avoid paying fixed costs in the short run. Hence, if revenues exceed variable costs then, even if a loss is being incurred overall, they are better off producing than not.
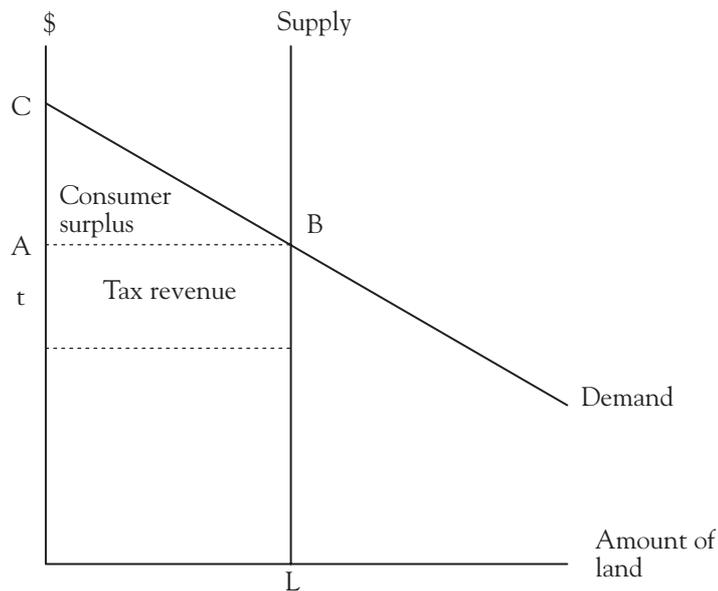
Exercise 14

Henry George, a nineteenth-century American economist, proposed raising all government revenues by taxing land. The supply of unimproved land was fixed (perfectly inelastic) so that, with increases in demand due to population growth, rich landowners (he claimed) would get even richer.

a. Show that a tax on rents from land is borne entirely by landowners not by renters.

b. Show that a tax on land rents creates no social deadweight losses.

c. Would your answers to (a) and (b) hold if the tax was levied on the improved value of land?

d. Is a tax on land a practical way of meeting society's taxation needs?

Answers

a. Supply is not altered by such a tax. Landowners have nothing else to do with their land, so they rent out the same amount. All that happens is that some of the rents previously paid to land owners get paid to the government as tax. If t is the tax and L is the amount of land, then the transfer to the government is $t \times L$, in the following figure.

b. This follows from (a). There is a transfer of seller surplus to the government but no reduction in total surplus (defined inclusive of government revenue). The level of land rented remains the same. Hence, no deadweight losses.

c. No, and this is a limitation of this proposal. The value of land often comes from improvements on it. For example, building roads and providing sewers. If a tax is imposed on land that owners have to invest in to improve, they will improve that land less. Therefore, the supply of *improved land* is somewhat price elastic. In this case some of the effects of a tax will be borne by consumers and there will be deadweight losses.

d. No, it would not. Apart from the effect of decreasing the quality of land improvements, the value of such taxes would not be sufficient to meet government revenue needs. The tax base is not broad enough. (Of course, Henry George would not accept this criticism. He argued that limited land taxes set a desirable upper limit on government!)