Handout 7: The Costs of Production

Mankiw Ch 14

Problem 1. Sam's bike shop

Sam quit a job that paid $62,000 a year to open a bike repair shop. He put $50,000 of his savings into the shop; the bank pays 4% a year on savings. In the shop's first year:

Revenue from repairs and sales	$150,000
Bike parts	30,000
Rent	24,000
A part-time mechanic	26,000

a) List Sam's explicit costs and his implicit costs, and find the total of each.

b) Find Sam's accounting profit and his economic profit.

c) Sam's friend says: "You made $70,000. That beats your old $62,000 job by $8,000." Is the friend right? Explain in two sentences.

d) Suppose instead Sam had borrowed the $50,000 from the bank at 4% and kept his savings in the bank. Which of the two profits changes, and by how much?

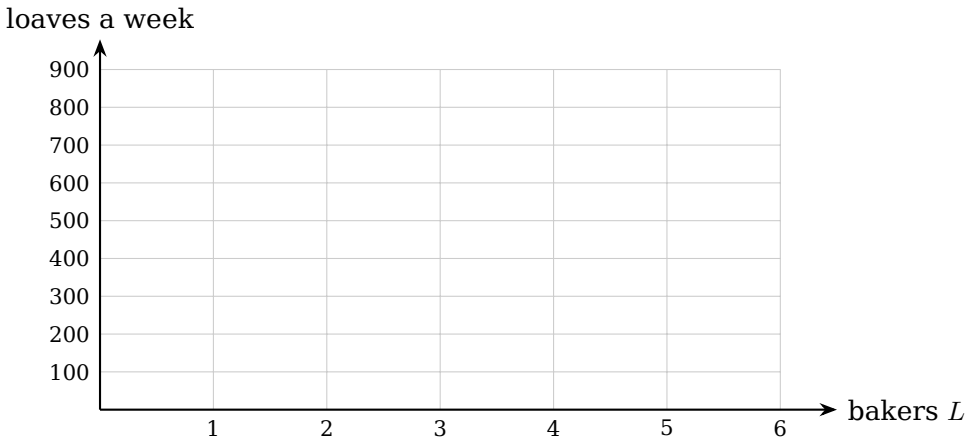
e) The landlord raises the rent by $10,000 a year. Find the new accounting and economic profit. Should Sam keep the shop open in the long run? Answer in two sentences.

Problem 2. Rosa's bakery

Rosa rents one oven for $600 a week. She can hire as many bakers as she likes at $800 a week each. Her weekly output (L is bakers, Q is loaves, TC is total cost, MC is marginal cost per loaf):

L	Q	MP_L	TC	MC	ATC	AVC
0	0		\$600			
1	200					
2	450					
3	600					
4	700					
5	760					
6	800					

a) Fill in the marginal product of labor. Graph the production function on the grid. Where does diminishing marginal product begin? Why does the second baker add more than the first?



b) Fill in total cost. Then find the marginal cost of a loaf for each baker hired, and show that $MC = \text{wage}/MP_L$.

c) Fill in average total cost and average variable cost. What is Rosa's efficient scale? Check that marginal cost is below ATC while ATC falls and above it while ATC rises.

d) The oven rent rises from \$600 to \$1,000 a week. Which columns of the table change, and which do not? Find the new ATC at each output and the new efficient scale.

e) Back to $600 rent. Instead, bakers' pay rises from $800 to $1,000 a week. What happens to marginal cost? Does the efficient scale change?

Problem 3. A T-shirt printer

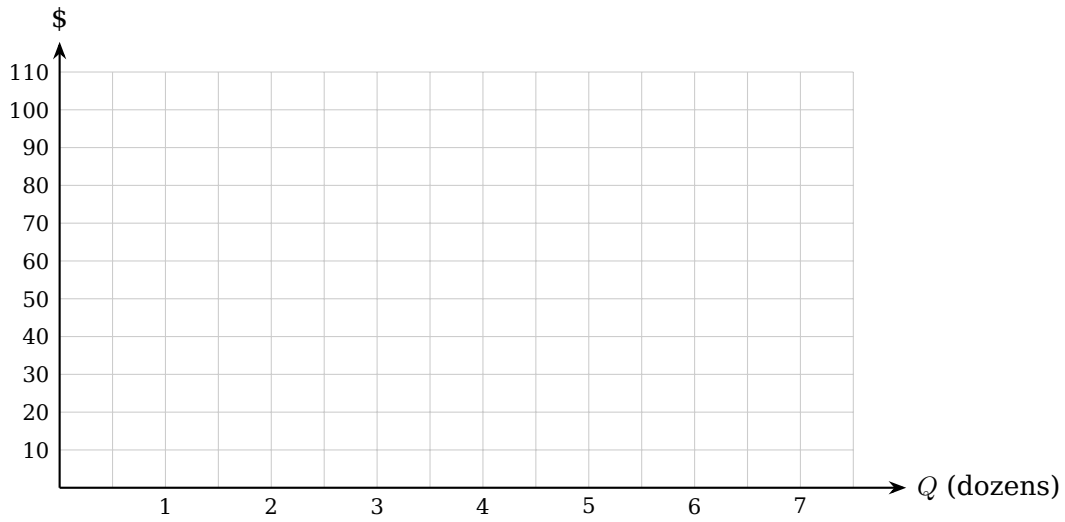
A T-shirt printer's monthly costs; Q is dozens of shirts. Each row gives one number. Fill in the rest.

Q	TC	FC	VC	AFC	AVC	ATC	MC
0	\$60						
1			40				
2							30
3						52.00	
4	190						
5					34.00		
6							58
7			308				

a) Complete the table. Start from $Q = 0$: what does it tell you about fixed cost?

b) What is the efficient scale? At what output is AVC lowest?

c) Graph AVC, ATC and MC on the grid (plot each MC halfway between the two outputs, for example the \$40 of the first dozen at $Q = 0.5$). Where does MC cross the other two curves?



d) From $Q = 3$ to $Q = 4$, marginal cost rises from \$26 to \$34, yet ATC falls from \$52.00 to \$47.50. A classmate says this is a mistake in the table. Is it? Explain in two sentences.

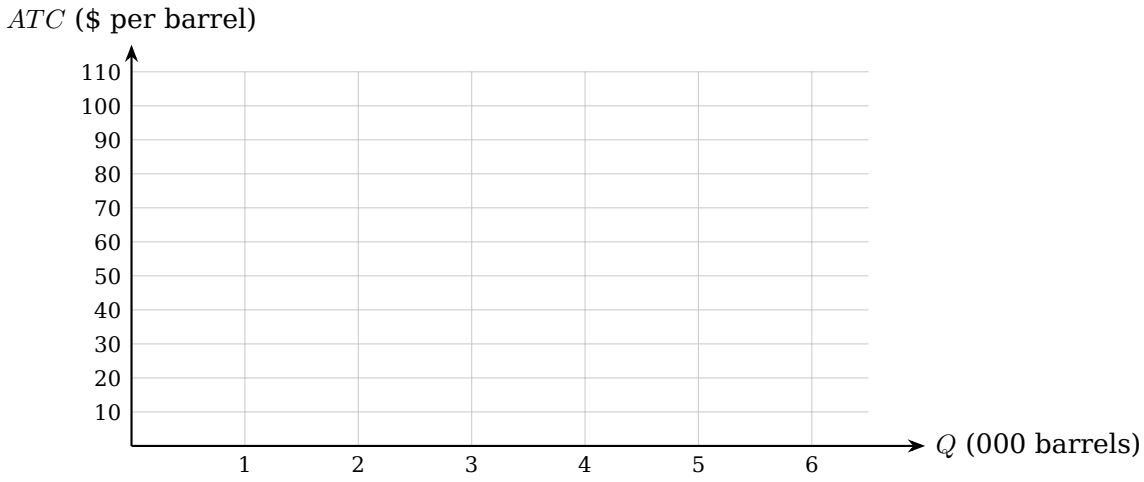
Problem 4. Building a brewery

A brewery can build a small, a medium or a large plant. Average total cost per barrel, by output (thousands of barrels a year):

Q (000)	1	2	3	4	5	6
Small	\$50	\$40	\$45	\$60	\$80	\$105
Medium	70	45	34	32	38	50
Large	95	70	50	40	36	38

a) Before it builds, the brewery can pick any plant. For each output, which plant should it build, and what is its long-run average total cost?

b) Sketch the three short-run ATC curves and the long-run ATC curve. Over what outputs does the brewery have economies of scale? Diseconomies?



c) The brewery built the small plant to make 2,000 barrels. Demand grows, and it now wants to make 4,000. What is its average and total cost this year, before it can build? What will they be once it builds the right plant?

d) Is a bigger plant always cheaper per barrel? Answer in two sentences, using the table.

Problem 5. Short questions

Answer each in two or three sentences.

a) A firm sells its output for $40 a unit. Its average total cost is $24.50 when it makes 150 units and $24.55 when it makes 151. Find total cost at each output and the marginal cost of the 151st unit. Should the firm make it? Of average fixed cost, average revenue, total cost and total revenue, which is the same at 150 and 151 units?

b) A warehouse pays packers $20 an hour. The next packer it hires would pack 40 boxes an hour. What is the marginal cost of a box? A new conveyor belt lets each packer pack 80 boxes an hour; what is the marginal cost now?

c) A restaurant has a five-year lease, a chef on a yearly salary, servers paid by the hour, and a food bill. Which of these costs are fixed over the next month? Which are fixed over the next ten years?

d) A streaming service spends $200 million to make a series. Serving each subscriber costs $1. Find the average total cost per subscriber at 1 million, 10 million and 100 million subscribers. What does this say about the number of streaming services that can survive?