Unit 5. Producer theory: revenues and costs

Quiz

1. The production process described below exhibits

Number of Workers	Output
0	0
1	23
2	40
3	50

A. constant marginal product of labour

B. diminishing marginal product of labour

C. increasing returns to scale

D. increasing marginal product of labour

E. decreasing returns to scale

The answer is B. Calculate marginal product of labour to see that it is decreasing when number of workers goes up.
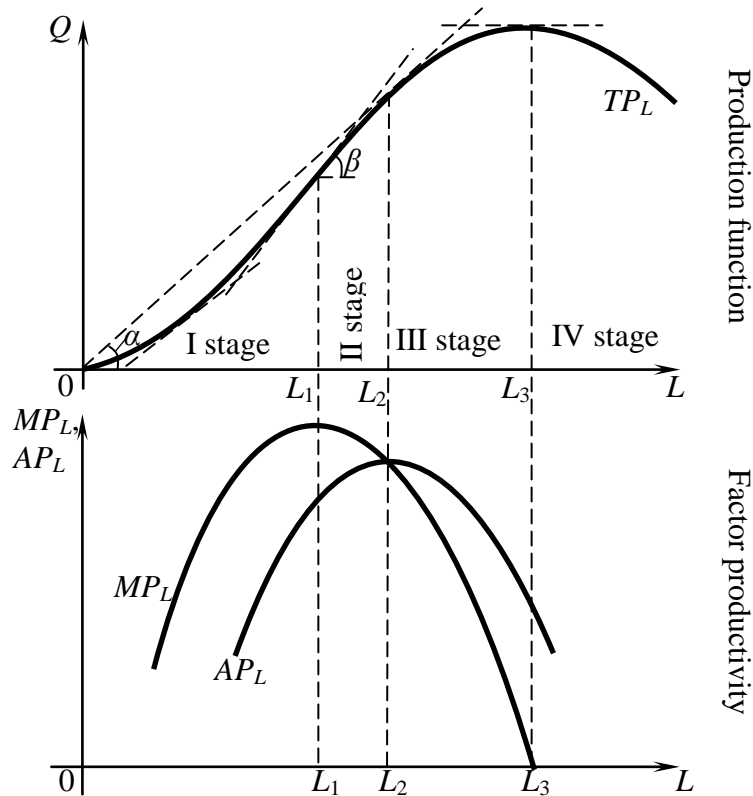
Number of Workers	Output	Marginal product of labour
0	0	-
1	23	23
2	40	17
3	50	10

2. If a production technology is characterized by diminishing marginal product, the total product curve

A. is linear (a straight line)

B. becomes steeper as the quantity of the input increases

C. becomes flatter as the quantity of the input increases

D. may be of any kind as given by the answers above

E. no true answer

The answer is C. The slope of a line tangent to total product curve is decreasing when the quantity of labour hired goes up at the II, III and IV stages of production (see the figure below).

Production technology in short run

3. If a production technology is characterized by diminishing marginal product, the corresponding total cost curve

A.   is linear (a straight line)
B.   becomes steeper as the quantity of output increases
C.   becomes flatter as the quantity of output increases
D.   may be of any kind as given by the answers above
E.   no true answer

The answer is B. $MC = \frac{d(wL(Q))}{dQ} = w\frac{dL}{dQ} = \frac{w}{dQ/dL} = \frac{w}{MP_L}$. Consequently, decreasing marginal productivity of labour implies increasing marginal costs which are represented by a slope of a line tangent to total cost curve. Marginal product of labour is diminishing at the II, III and IV stages of production, i.e. when $L > L_1$. At the corresponding output range $Q > Q_1$ the slope of a line tangent to total product cost tends to go up with an increase in output (see the figure below).

Production technology and cost curves in short run
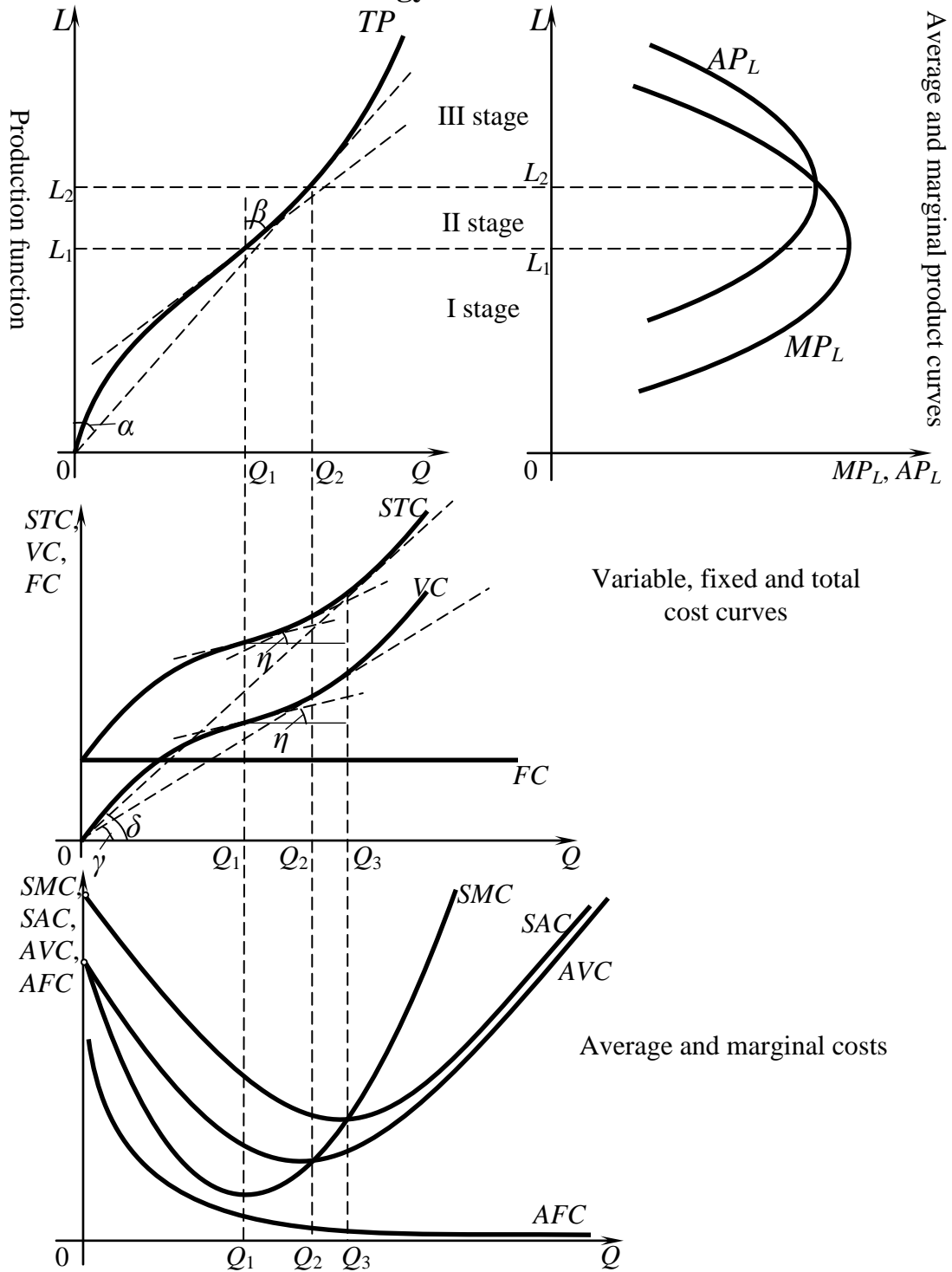
4. The following table indicates a production process characterized by

A.   decreasing returns to scale

B.   constant returns to scale

C.   increasing returns to scale

D.   increasing returns to labour

E.   constant returns to labour

		Output					
	6	346	490	600	692	775	846
	5	316	448	548	632	705	775
Units of capital	4	282	400	480	564	632	692
	3	245	346	423	490	548	600
	2	200	282	346	400	448	490
	1	141	200	245	282	316	346
	0	1	2	3	4	5	6
		Units of labour					

The answer is B. Take *L=K=1* for initial quatities of inputs. The corresponding output is *Q=141*. If *L=K=2* output becomes twice as much as well: *Q=282*. If inputs triple (*L=K=3*) output also becomes three times as much: *Q=423*. When inputs become four times as much as initially (*L=K=4*) the factor of growth of output is also 4: *Q=564*. If inputs are 5 times as much (*L=K=5*) output grows in the same proportion: *Q=705*. And finally with 6 times as much inputs output is also 6 times as much as it has been initially: *Q=846*.

5. Which of the following is true about the distance between average variable cost and average total cost when graphed?

A. It becomes smaller as output goes up

B. It becomes larger as output goes up

C. It is equal to average fixed cost at all levels of output

D. It is zero at all levels of output

E. The answers A and C are both correct

The answer is E. $TC = VC + FC$, $ATC = \frac{TC}{Q} = \frac{VC}{Q} + \frac{FC}{Q} = AVC + AFC$, where $FC = const$, i.e. $ATC - AVC = AFC = \frac{FC}{Q}$, and it is declining when output expands.

6. The efficient scale of production is the output that minimizes

A.   average fixed cost

B.   average total cost

C.   average variable cost

D.   marginal cost

E.   the answers B and C are both true

The answer is B. By definition. This output exploits returns to scale to the full extent.

7. The long-run average cost curve

A. is always below the short-run average cost curve

B. is always above the short-run average cost curve

C. always intersects the short-run average cost curve at the minimum of the short-run average cost curve

D. is above the short-run average cost curve except at one point

E. is below the short-run average cost curve except at one point

The answer is E. Fixed capital input in short run is usually not optimal as compared to long run cost-minimizing input combination. It implies that short run total and average total cost is exceeds the corresponding long run costs. Only in case when capital input in short run coincides with cost-minimizing capital input in long run average total cost is one and the same in short run and in long run. These are for instance the points with output Q_1, Q_3 and Q_5 in the figure below.

Long run and short run cost curves
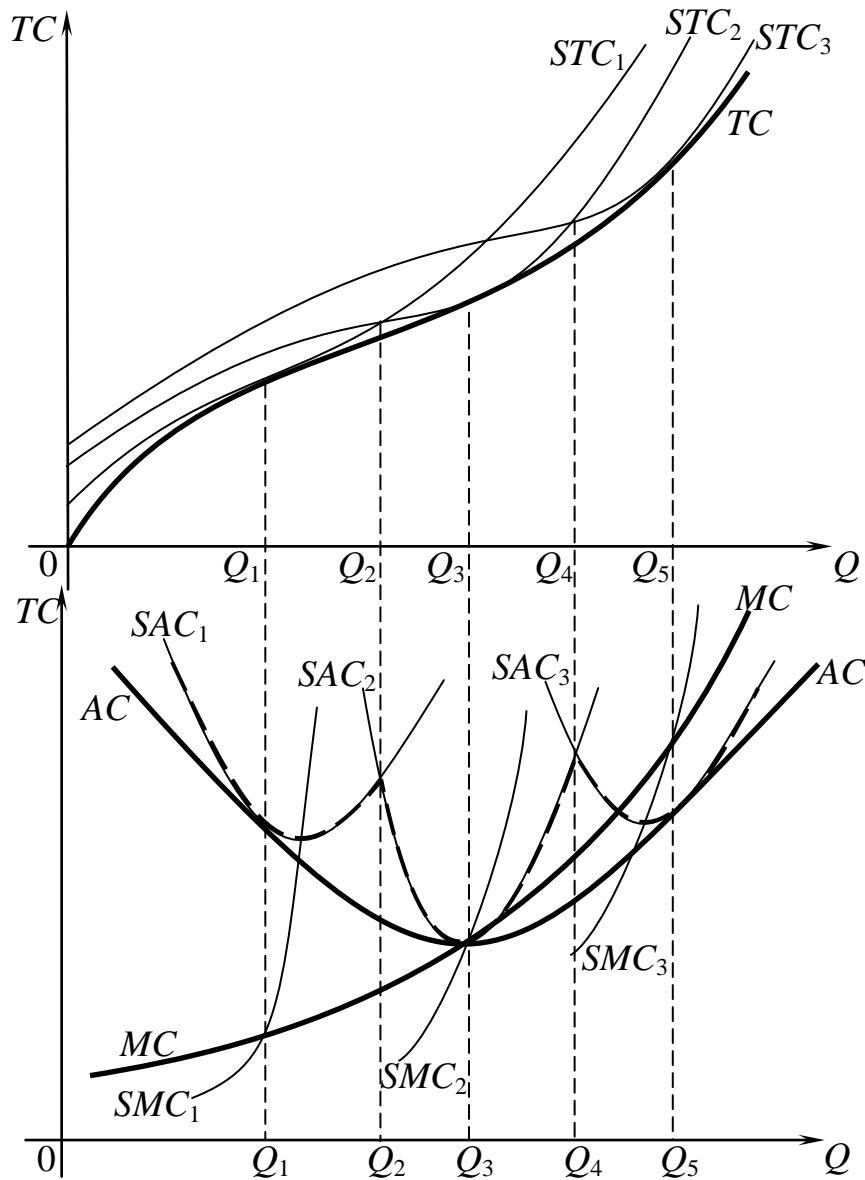
8. If marginal costs are equal to average total costs

A. average total costs are falling

B. average total costs are rising

C. average total costs are maximized

D. average total costs are minimized

E. average variable costs are minimized

      The answer is D. Suppose that marginal costs are less than average costs, i.e. the cost of producing the last, incremental unit of good is less than unit cost of production of the given amount of the good on the average. It means that average costs of producing total output, including the last unit, will go down, and average cost curve will be downward sloping.

And vice versa, if marginal cost exceeds average cost, production of an additional unit of the good will push per-unit costs up, and average cost curve will be upward bending. It follows that marginal cost (MC and SMC) curve intersects average cost (AC and SAC) curve at the minimum of the latter (see the figure below).

To prove it take a derivative of average costs:

$$\frac{dAC}{dQ} = \frac{d}{dQ}\left(\frac{TC}{Q}\right) = \frac{Q \cdot MC - TC}{Q^2} = \frac{MC - AC}{Q}.$$

At the point of minimum of average costs $\frac{dAC}{dQ} = 0$, that yields $AC = MC$.
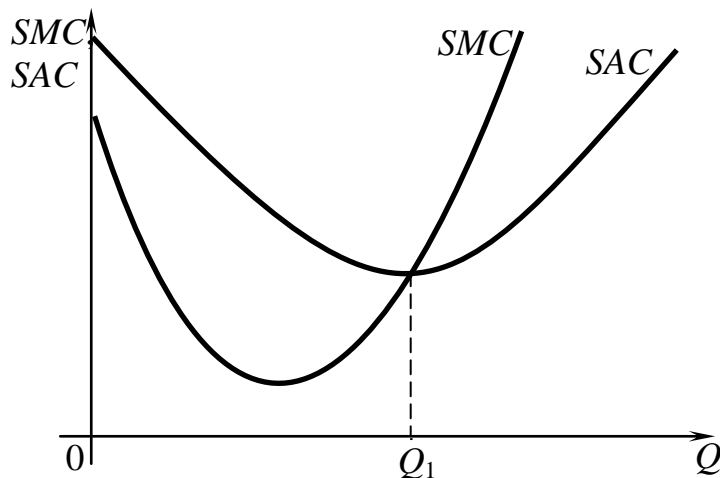
9. When a firm is earning a normal profit from the production of a good, it is true that

A. total revenues from production are equal to explicit costs.

B. explicit costs are equal to implicit costs.

C. total revenues from production are equal to implicit costs.

D. total revenues from production are equal to the sum of explicit and implicit costs.

E. implicit costs are greater than explicit costs.

The answer is D. See the table below.

Total revenue (TR)	Economic profit (PR_{EC})		Accounting profit (PR_{AC})
	Economic costs (TC_{EC})	Implicit costs (TC_{IMP})	(PR_{AC})
		Explicit costs (TC_{EXP})	Accounting costs (TC_{AC})

Thus, $TR - TC_{EC} = TR - (TC_{IMP} + TC_{EXP}) = PR_{EC}$. It follows that $TR = TC_{IMP} + TC_{EXP}$, when $PR_{EC} = 0$.

10. Marginal revenue equals marginal cost at the point where

A. the difference between total revenue and total cost is the greatest

B. total revenue is equal to total cost

C. marginal product is at its maximum

D. total product is at its maximum

E. average total cost is at its minimum

The answer is A. $MR = MC$ is the first order condition of profit maximization.