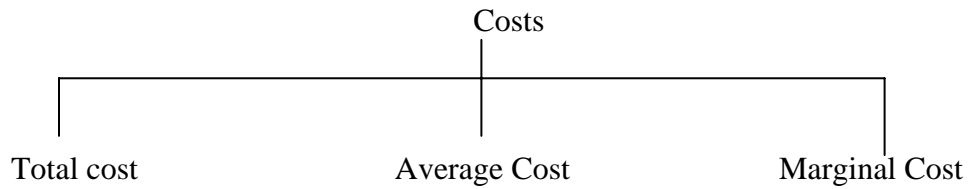


WEEK 3: THEORY OF PRODUCTION & COST

COSTS IN THE SHORT-RUN AND LONG-RUN



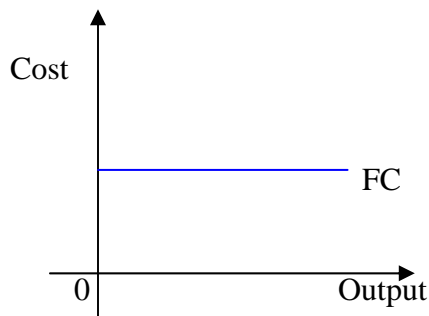
TOTAL COST (TC)

Total cost is the cost of all resources necessary to produce any particular level of output. Total cost rises with output.



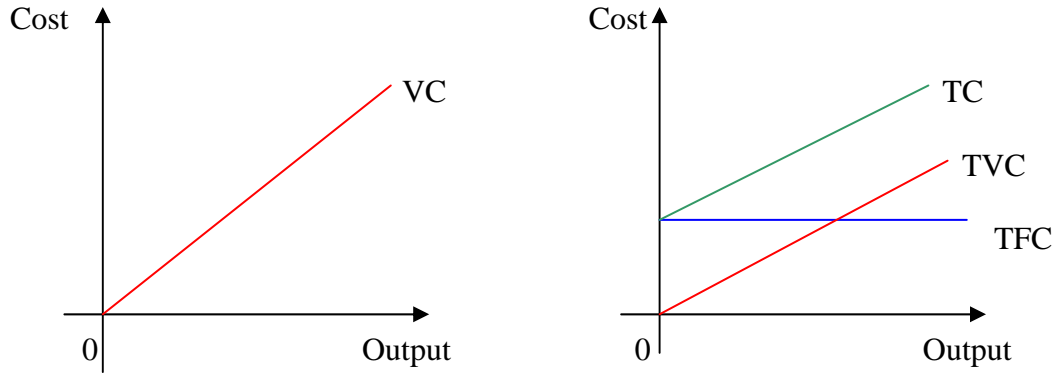
Fixed costs

Fixed costs are those costs that do not alter with output in the *short-run*. They may also be termed as “*indirect costs*”. These costs will remain constant regardless of the amount of production.



Variable Costs (VC)

Variable costs are those costs that vary with output.



Short run is the period of time where at least one factor of production is fixed in supply. It may also be defined as the period where output may be varied within the limits of the fixed cost. It is not possible for new firms to enter the industry or for existing firms to leave it.

Long run is the period of time in which all factors of production may be varied or all costs are variable and where the firms may enter or leave the industry.

AVERAGE COST (AC/ATC)

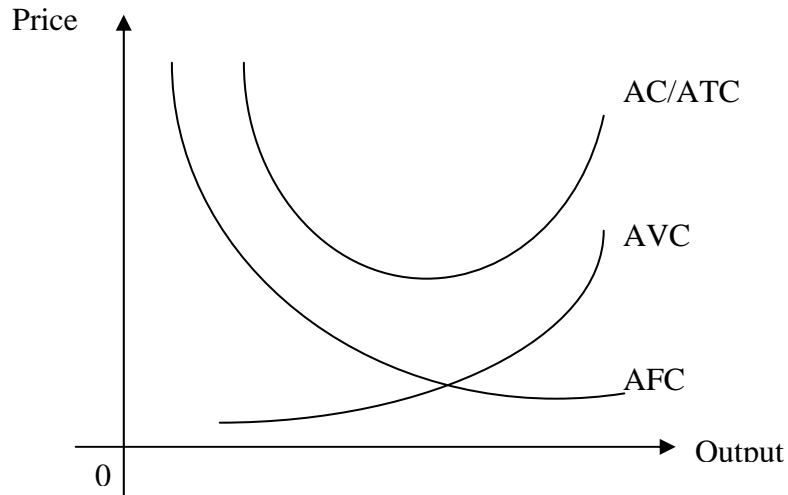
Average cost (AC) is the total cost divided by the number of units of commodity produced.

$$AC = \frac{\text{Total Cost}}{\text{Output}} = \frac{TC}{Q}$$

$$\text{Average Fixed Cost (AFC)} = \frac{\text{Total Fixed Cost}}{\text{Output}} = \frac{TFC}{Q}$$

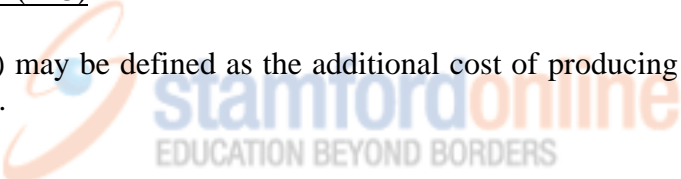
$$\text{Average Variable Cost (AVC)} = \frac{\text{Total Variable Cost}}{\text{Output}} = \frac{TVC}{Q}$$

$$ATC / AC = AFC + AVC$$



MARGINAL COST (MC)

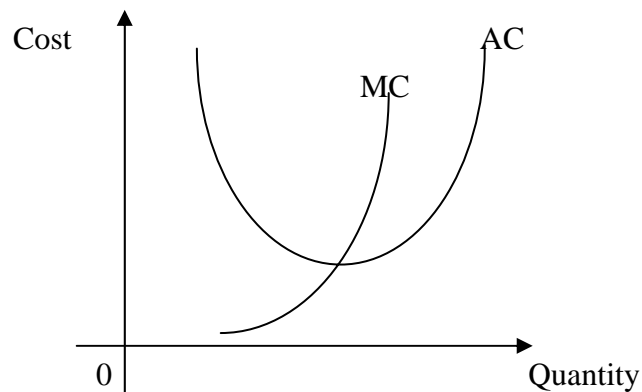
Marginal Cost (MC) may be defined as the additional cost of producing one more (or less) unit of a commodity.



$$MC = \frac{\Delta TC}{\Delta Q}$$

$$MC_n = TC_n - TC_{n-1}$$

Average Cost and Marginal Cost



Relationship between average cost and marginal cost.

1. The Marginal Cost curve always cuts through the Average Cost curve at the lowest/minimum point.
2. Marginal Cost curve starts by falling, fairly quickly reaches its lowest level and then starts rising and cutting average cost curve at the lowest point.
3. When the average cost is rising, the marginal cost will always be higher than the average cost. **As $AC \uparrow \Rightarrow MC > AC$.**
4. When the average cost is falling, the marginal cost curve lies below it. **As $AC \downarrow \Rightarrow MC < AC$.**

SHORT RUN PRODUCTION

Machine	Labour	Total Production of Labour, TP	Average Production of Labour, AP	Marginal Production of Labour, MP
1	1	3	3/1	
1	2	7	7/2	4
1	3	12	12/3	5
1	4	16	16/4	4
1	5	19	19/5	3
1	6	21	21/6	2
1	7	22	22/7	1
1	8	22	22/8	0
1	9	21	21/9	-1
1	10	15	15/10	-6

The Law of Diminishing Marginal Returns

When variable factors of production are combined with fixed factors of production, total production will increase as the amount of the variable factor is increased. Initially, the increase in total output will be at an increasing rate but eventually the increase will be at a decreasing rate until a certain maximum point of total production after which total production declines.

COSTS IN THE LONG-RUN

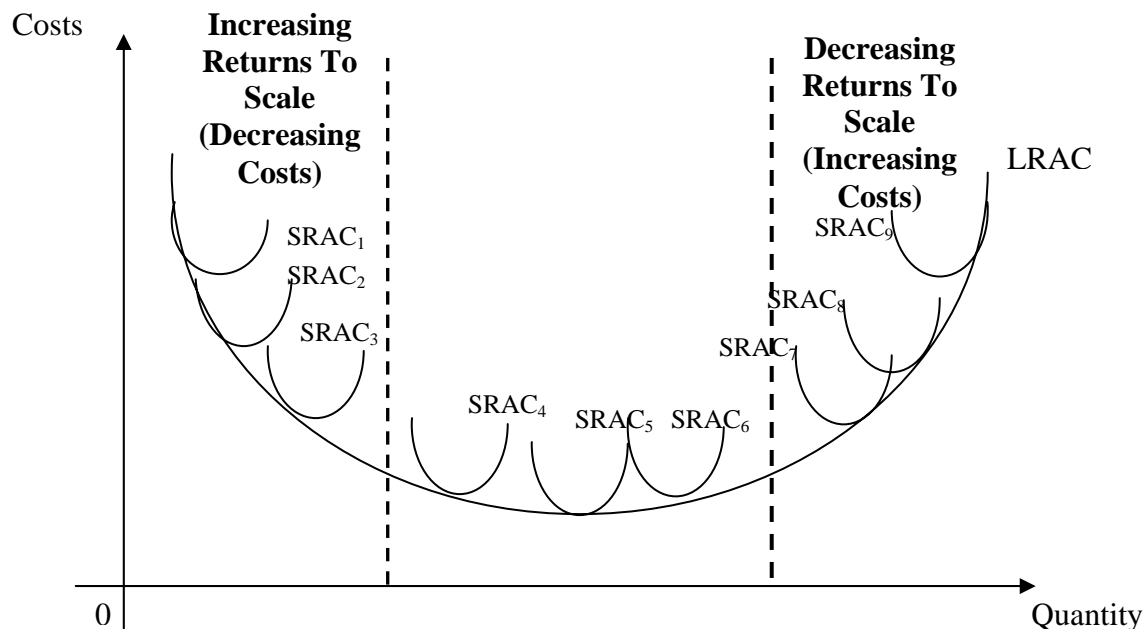
In the long run, all inputs are variable, so the problems associated with the diminishing returns to variable costs is not important.

In more general terms, the producers can change its scale of production or plant size in the long run.

As the scale of production increases, producers may experience *economies of scale* (*decreasing cost or increasing returns to scale*) or *diseconomies of scale* (*increasing cost or decreasing returns to scale*) or *constant returns to scale*.

Returns to scale are concerned with physical input and output relationships, i.e. returns to scale are concerned with improvements or declines in productivity by increasing the scale of production.

This situation can be illustrated in a long run average cost curve which is an “envelope” curve of all possible short run average cost curves.



REVENUE**TOTAL REVENUE**

Total revenue is the total income obtained from selling a given quantity of an output.

$$\mathbf{TR = Price \times Quantity\ sold}$$

AVERAGE REVENUE

Average revenue is the total income divided by the number of units of the commodity sold.

$$AR = \frac{TR}{Q} = \frac{P \times Q}{Q} = P$$

MARGINAL REVENUE

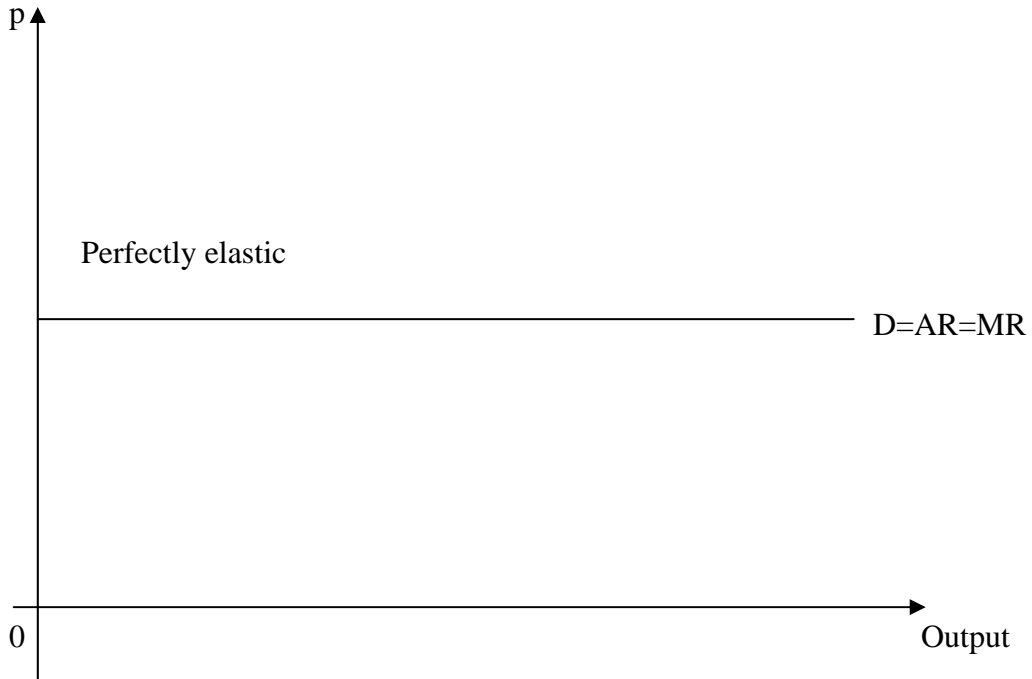
Marginal revenue is the addition to total revenue earned from the sale of one extra unit of output.

$$MR = \frac{\Delta TR}{\Delta Q}$$



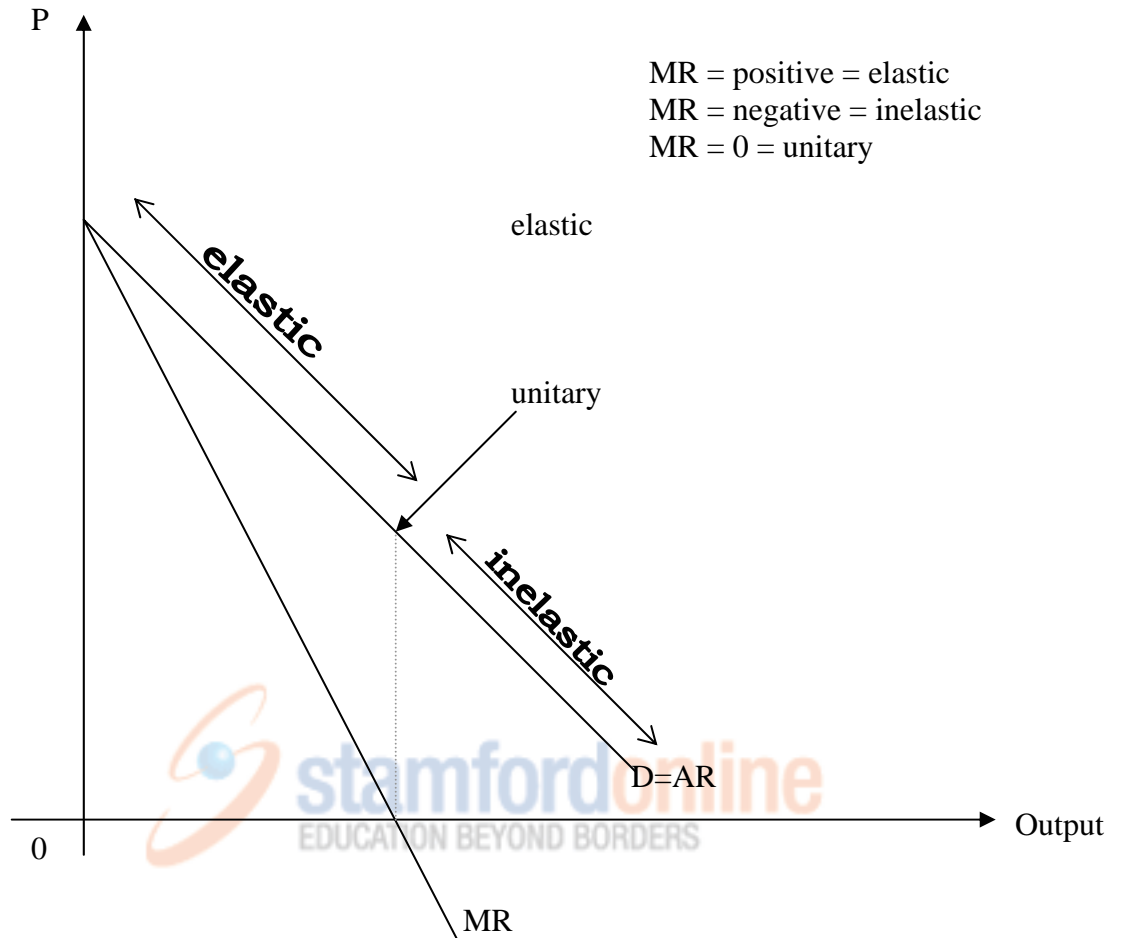
$$MR_n = TR_n - TR_{n-1}$$

Output	Price	TR	AR	MR
0	5			
1	5			
2	5			
3	5			
4	5			
5	5			
6	5			
7	5			
8	5			
9	5			
10	5			



The figure above represents the demand curve for the individual firm's product under perfect competition.

Output	Price	TR	AR	MR
0	-			
1	10			
2	9			
3	8			
4	7			
5	6			
6	4			
7	3			
8	2			
9	1.5			
10	1			



The figure above represents the demand curve for the individual firm's product under imperfect competition (monopoly and monopolistic).

PROFITS

Profits are the difference between *total revenue* and *total cost*.

$$\Pi = TR - TC$$

Sub-normal profits ($AR < AC$)

Normal profits ($AR = AC$)

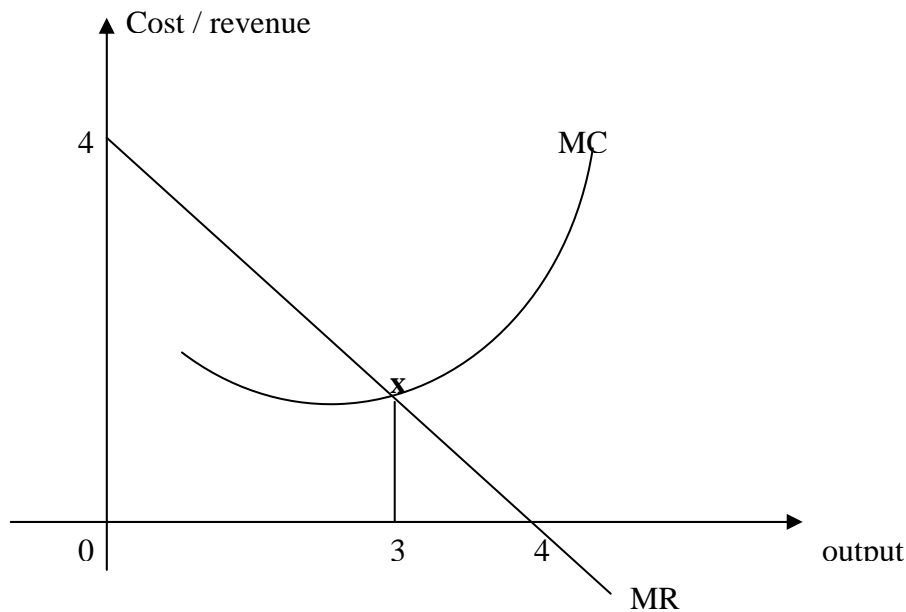
Supernormal profits ($AR > AC$)

SHORT RUN PROFIT MAXIMIZATION (using marginal and average cost curves)

Finding the maximum profit a firm can make is a two-stage process. First, is to find the profit-maximizing output. Second, is to find how much profit is at this output.

First stage

To find the profit maximizing output, we use the MR and MC curves. Profit maximization is where **MR = MC**.

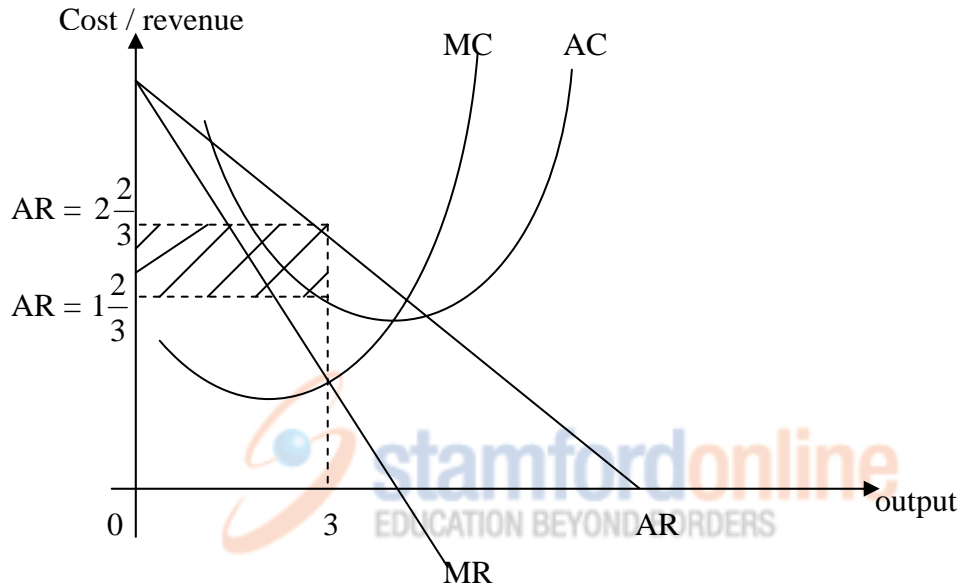


In the above diagram, profit-maximizing output is at the point **x** which is equal to *3 units*.

As long as MR exceeds MC, profits can be increased by increasing production.

Second stage

To find how much profit is at profit maximizing output, we use *average cost* and *average revenue* curve.

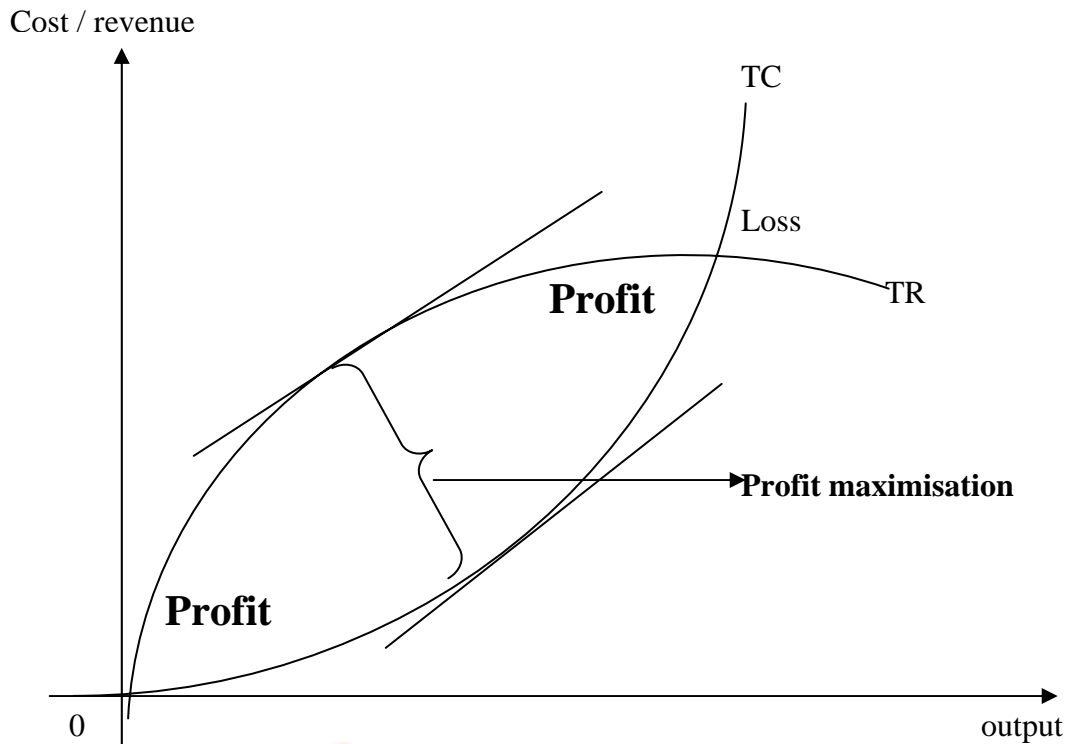


In the above diagram, total profit obtained at profit maximizing output is equal to (AR –

$$AC) \times \text{output} = \left(2\frac{2}{3} - 1\frac{2}{3} \right) \times 3 = RM 3$$

Profit maximization can also be found by using total revenue and total cost curves.

Mathematical way of finding the total profit is: **TP = TR – TC**

**Learning Outcomes:**

Students should be able to:

- Differentiate between short run and long run
- Identify various cost and production functions
- Illustrate economies and diseconomies of scale

Main Reference

Case, K. E., & Fair, R. C. (2007). *Principles of Economics* (8th ed.). Prentice Hall, Chapters 7, 8 & 9.

Other Reference

Sloman, J. (1999). *Essentials of Economics* (3rd ed.). Prentice Hall, Chapter 5.

Review Questions

1. Distinguish between the short run and the long run.
2. State the law of diminishing returns in terms of labour and land.
3. Why are the MC, AVC, and AC curves U-shaped?