27 August 2023 06:59 PM

Revenues :
1) $TR = P \times Q$
2) $AR = \frac{TR}{Q} = \frac{P \times \cancel{Q}}{\cancel{Q}} = P$ (it is fixed in Perfect competition at variable in a monopoly market).

3) $MR = \frac{\Delta TR}{\Delta Q} = P$ (fixed in PC)
and variable in monopoly.

Costs :
$TC = TVC + TFC$

$\frac{TC}{Q} = \frac{TVC}{Q} + \frac{TFC}{Q}$

$\boxed{AC = AVC + AFC}$

Profit :
$\pi = TR - TC$

at maximum profit $\frac{\Delta \pi}{\Delta Q} = 0$
and $MR = MC$
incase of PC $\Rightarrow$ $\boxed{\bar{P} = AR = MR = MC}$

Numericals :

1. Suppose that a competitive firm's marginal cost of producing output q is given by $MC(q) = 3 + 2q$. Assume that market price of the firm is $P = 9$.

a) What level of output will the firm produce.

In a competitive mkt, $MC = P$
Here $MC = 3 + 2q$
and $P = 9$

$$\therefore\ 3 + 2q = 9$$

$$\Rightarrow\ 2q = 6$$

$$\Rightarrow\ \boxed{q = 6/2 = 3 \text{ units}}$$

b) Suppose that AVC is $AVC(q) = 3 + q$. Suppose that firm's fixed cost is \$3. Will the firm be earning a positive, negative or zero profit in short-run?

We have $P = 9$, $q = 3$ units

$$\boxed{AVC = 3 + q} \quad TFC = \underline{3}$$

let us calculate TR i.e. $P \times Q$

$$\therefore\ \boxed{TR = 9 \times 3 = \$27}$$

What is $\boxed{TC = TVC + TFC}$

at $q = 3 \Rightarrow AVC = 3 + 3 = 6$ units

and $AVC = \dfrac{TVC}{Q}$

$$\therefore\ TVC = AVC \times Q$$

$$TVC = 6 \times 3$$

$$TVC = ₹18$$

$$\therefore\ TC = TVC + TFC$$

$$\boxed{TC = 18 + 3 = \$21}$$

So $TR = \$27$ and $TC = \$21$

$$\therefore\ \text{Profit},\ \pi = TR - TC$$

$$= 27 - 21$$

$$\boxed{\pi = \$6} > 0$$

$$\boxed{\pi = \$6} > 0$$

$\therefore$ profit is +ve ~~that~~ is supernormal profit.

2) Suppose the same firm's cost function is

$$C(q) = 4q^2 + 16$$

Find the variable cost (TVC), fixed cost (TFC), average variable cost (AVC) and average fixed cost (AFC)?

TVC varies with output
TFC is the fixed part

Given $\underline{TC} = C(q) = 4q^2 + 16$ — (1)

from (1) $TVC = 4q^2$ and $TFC = 16$

$AVC = \frac{TVC}{q} = \frac{4q^{\cancel{2}}}{\cancel{q}}$ and $\boxed{AFC = \frac{TFC}{q} = \frac{16}{q}}$

$$\boxed{AVC = 4q}$$

3) Suppose that a competitive firm has a total cost function

$$C(q) = 450 + 15q + 2q^2$$

and marginal cost function, $MC(q) = 15 + 4q$. If the market price is $P = 115$ per unit, find the level of output produced by the firm. Find the level of profit.

Soln we are given, $C(q) = 450 + 15q + 2q^2$ (Total cost)

$$MC = 15 + 4q$$

and $P = 115$

In P.C market, MR = P = 115

And to find output, MR = MC

or, 115 = 15 + 4q

or, 4q = 100

or, $\boxed{q = 25 \text{ units}}$

we know, profit π = TR − TC

what is $TR = P \times q = 115 \times 25$

$\boxed{TR = 2875}$

and $TC = 450 + 15q + 2q^2$

$\therefore$ at q = 25

$TC = 450 + 15 \times 25 + 2 \times (25)^2$

$= 450 + 375 + 1250$

$= 825 + 1250$

$\boxed{TC = 2075}$

$\therefore \pi = 2875 - 2075$

$\boxed{\pi = ₹\,800}$

2875
2075
———
800

Q4 Consider a city that has a number of hot dog stands operating throughout the downtown area.
Suppose that each vendor has a marginal cost of ₹ 1.50 per head and no fixed cost.
Let the maximum number of hot dogs that any one vendor can sell in a day is 100 per day.

(a) If the P = \$2, how many hot dogs each seller want to sell

ans $\boxed{q = 100 \text{ units}}$

(b) If the industry is in perfect competition will the price remain at \$2? If not what will be the price?

the price remain at \$2? If no ... price?

In the present case price per hot dog = \$2

MC per hot dog = \$1.50

profit per hot dog = 2 − 1.50

= \$0.50

∴ Total profit after selling 100 units = 0.50 × 100

= \$50 > 0

(Super normal profit)

due to super normal profit, new sellers will enter the market freely as a result price begins to falls due to increase in supply.

∴ Therefore price will change.

P = min AVC

at min AVC; AVC = MC = \$1.50

∴ $\boxed{P = \$1.50}$ new price

and there will be 0 profit.

(c) If each vendor sells exactly 100 hot dogs a day and the demand for hotdogs from vendor in the city is

$Q = 4400 - 1200P$, how many

vendors are there?

Case I: Short-run when price $\boxed{P = \$2}$

then $Q = 4400 - 1200P$

or, $Q = 4400 - 1200 \times 2$

or, $Q = 4400 - 1200 \times 2$

or, $Q = 4400 - 2400$

$\boxed{Q = 2000 \text{ units}}$

each vendor can sell $(q) = 100$ units of hot dog

$\therefore$ No. of vendors, $(n) = \frac{Q}{q} = \frac{2000}{100} = 20$ vendors

Case (ii) In Long run, price drops to $\boxed{P = \$1.50}$ due to increase in supply (free exit)

$Q = 4400 - 1200 \times P = 4400 - 1200 \times 1.50$

$= 4400 - 1800$

$\boxed{Q = 2600} \text{ units}$

So the number of vendors, $\boxed{n = \frac{Q}{q} = \frac{2600}{100} = 26 \text{ vendors}}$

(d) Suppose the city decides to regulate hot dog vendors by issuing permits. If the city issues only 20 units and if each vendor continues to sell 100 hot dogs a day, what price will a hotdog sell for.

Ans if 20 sellers sell, 100 hot dogs each day then total quant sold will be 2000 units

Then ... se 2000 units

$Q = 4400 - 1200P$

$2000 = 4400 - 1200P$

$P = \dfrac{4400 - 2000}{1200} = \dfrac{\cancel{2400}}{\cancel{1200}} = 2$

$\boxed{P = \$2}$ ans.

(e) Suppose the city decides to sell permits. What is the highest price a vendor would pay for a permit.

at $P = \$2 \Rightarrow \boxed{\text{profit is } \$0.50}$

↳ max price is this offered by vendor for a permit.