ANSWER No #01

(a)

$$\frac{dAC}{dQ} = \frac{-25,000}{Q^2} + 3 = 0$$

$Q = 91.3$

$$AC = \frac{25,000}{91.3} + 150 + 3(91.3)$$

$\boxed{AC = 697.7}$

(b)

- Monthly output for this firm would be $\boxed{91.3 \text{ units}}$

ANSWER no #02

(a)

$140{,}000 - 10{,}000p = 80{,}000 + 5{,}000p$

$140{,}000 - 80{,}000 = 10{,}000p + 5{,}000p$

$60{,}000 = 15{,}000p$

$\frac{60{,}000}{15{,}000} = p$

$\boxed{4 = p}$ or $p = 4$

Statement:

- Equilibrium price of a box would be $\boxed{4}$, and yes, this is the long-run equilibrium.

(b)

At minimum level,

$$\frac{d(AVC)}{dQ} = 0 \quad , \quad \frac{d2(AVC)}{dQ^2} > 0$$

$$\frac{d(AVC)}{dQ} = -12 + 2Q = 0 \; , \; \frac{d2(AVC)}{dQ^2} = 2 > 0$$

$-12 + 2Q = 0$ i.e $\boxed{Q = 6}$

- Hence, at $Q = 6$ AVC in at minimum.

Similarly, At minimom,

$$\frac{d(MC)}{dQ} = 0 \quad , \quad \frac{d2(MC)}{dQ^2} > 0$$

$$= -24 + 6Q = 0 \quad , \quad = 6 > 0$$

$-24 + 6Q = 0$ i.e $\boxed{Q = 4}$

Hence, it is noted at $Q = 4$, MC is minimum.

Statement:

- It is calculated that both AVC and MC carries a minimum rate at Q = 6 and Q = 4, att other level of output.

- AVC and MC both are higher, which means the "Curve will be in the shape of U".

(C)

when Q = 6

$AVC = 60 - 12Q + Q^2$

$AVC = 60 - 12(6) + 6(6)$

$AVC = 60 - 72 + 36$

$\boxed{AVC = 24}$

now, calculating MC

$MC = 60 - 24Q + 3Q^2$

$MC = 60 - 24(6) + 3(6)(6)$

$MC = 60 - 144 + 108$

$\boxed{MC = 24}$

(b)

At minimum level,

$$\frac{d(AVC)}{dQ} = 0 \quad , \quad \frac{d2(AVC)}{dQ^2} > 0$$

$$\frac{d(AVC)}{dQ} = -12 + 2Q = 0 \quad , \quad \frac{d2(AVC)}{dQ^2} = 2 > 0$$

$-12 + 2Q = 0$ i.e $\boxed{Q = 6}$

- Hence, at $Q = 6$ AVC in at minimum.

Similarly, At minimum,

$$\frac{d(MC)}{dQ} = 0 \quad , \quad \frac{d2(MC)}{dQ^2} > 0$$

$$= -24 + 6Q = 0 \quad , \quad = 6 > 0$$

$-24 + 6Q = 0$ i.e $\boxed{Q = 4}$

Hence, it is noted at $Q = 4$, MC is minimum.

ANSWER NO# 03

(a)

$TC = 100 + 60Q - 12Q^2 + Q^3$

As we know that,

TC = Total Fixed cost + Total Variable cost

Hence, Total Fixed cost $= 100$

- Total Variable cost $= 60Q - 12Q^2 + Q^3$

- $AVC = \dfrac{TVC}{Q} = 60 - 12Q + Q^2$

- $MC = \dfrac{d(TC)}{dQ} = 60 - 24Q + 3Q^2$

(b)

$$Q_d = 140{,}000 - 10{,}000(4) = 100{,}000$$
$$Q_s = 80{,}000 + 5{,}000(4) = 100{,}000$$

- It is noted that each firm produces 1,000 units, hence.

$$\frac{100{,}000}{1{,}000} = \boxed{100} \text{ firms}$$

Statement: Number of 100 firms are in this industry when it is ~~comes~~ in the long-run equilibrium.

ANSWER NO# 04

Total Revenue (TR) = Price x Quantity

$$TR = 4Q$$

Profit = Total Revenue (TR) - Total costs (TC)

$$\text{Profit} = 4Q - (0.04Q^3 - 0.9Q^2 + 10Q + 5)$$

$$\text{Profit} = -0.04Q^3 + 0.9Q^2 - 6Q - 5$$

$$\frac{dP}{dQ} = 0$$

$$-0.12Q^2 + 1.8Q - 6$$

$$-Q^2 + 15Q - 50 = 0$$

$$Q(-Q+10) - 5(10-Q) = 0$$

$$(Q-5)(Q-10) = 0$$

$$(Q=5) \text{ and } (Q=10)$$

For $Q=5$

$$\text{Profit} = -0.04(5)^3 + 0.9(5)^2 - 6(5) - 5$$

$$= \boxed{-17.5}$$

For $Q=10$

$$\text{Profit} = -0.04(10)^3 + 0.9(10)^2 - 6(10) - 5$$

$$= \boxed{-15}$$

Statement:

- As according to this calculation, we found out that the firm would be operating at loss. Hence, the firm should not produce this level of output

- Evidence shows that by selling at $4 per unit ~~from~~ generates negative profit.

ANSWER no# 05

$TC = 1500 + 15Q - 6Q^2 + Q^3$

- Fixed cost is the constant of total cost, constant of TC is ~~15,000~~ 1,500
- Hence,

  Fixed Cost (FC) = 1,500

  $AFC = \frac{FC}{Q}$.

- It is understood that total fixed cost (TFC) is constant irrespective of the quantity produced.

(a)

Total fixed cost at 1,000 units and 500 units are 1,500

Total Fixed Cost at,

$Q = 1000$ is $FC = 1,500$

$Q = 500$ is $FC = 1,500$

(b)

$$AFC = \frac{FC}{Q}$$

- at $Q = 1{,}000$

$$AFC = \frac{1500}{1000}$$

$$\boxed{AFC = 1.5}$$

- at $Q = 500$

$$AFC = \frac{1500}{500}$$

$$\boxed{AFC = 3}$$

(i) AFC at $Q = 1000$ is $\boxed{1.5}$

(ii) AFC at $Q = 500$ is $\boxed{3}$

(c)

TVC is the variable part of total cost.

$TVC = TC - FC = 15Q - 6Q^2 + Q^3$

$AVC = \frac{TVC}{Q} = 15 - 6Q + Q^2$

$AC = \frac{TC}{Q} = \frac{1500}{Q} + 15 - 6Q + Q^2$

$MC = \frac{dTC}{dQ} = 15 - 12Q + 3Q^2$

at $Q = 50$

$TVC = 15(50) - 6(50)^2 + (50)^3$

$TVC = 750 - 15{,}000 + 125{,}000$

$\boxed{TVC = 110{,}750}$

now, we find AVC,

$$AVC = \frac{TVC}{Q}$$

$$AVC = \frac{110{,}750}{50} = \boxed{2{,}215}$$

now, we find AC

$$AC = \frac{1500}{50} + 15 - 6(50) + 50^2$$

$$\boxed{AC = 2{,}245}$$

now, we find MC

$$MC = 15 - 12(50) + 3 - (50)^2$$

$$\boxed{MC = 6{,}915}$$

At 50 units of output:

- TVC = 110,750
- AVC = 2,215
- AC = 2,245
- MC = 6,915