0 a).

Profit = tr - tc

tr = Qp

$q1 = 80 - 2p1 - 2(p2+p3)$

$= 80 - 2p1 - 2p2 - 2p3$

p = 6.8

Q = 39.2

> Maximizing profit is tr = 270

tc = 39.2

profit = 231.8

b). p = 6.8

c). P = 7 , Q = 38

D.) Profit = tr - tc

$= P(Q_1 + Q_2 + Q_3) - 240 - 12P^*$

2.)

$\nabla L = 0 \longrightarrow (x^*, y^*, \lambda^*)$

$U^* = U(x^*, y^*)$

$\lambda^* = \frac{dU^*}{db}$

$$L(x,y,\lambda) = U(x,y) - \lambda(B(x,y) - b)$$

Step 1

$$\frac{\partial L}{\partial x} = \frac{\partial U(x,y)}{\partial x} - \lambda\left(\frac{\partial B(x,y)}{\partial x}\right) = 0$$

$$\frac{\partial L}{\partial y} = \frac{\partial U(x,y)}{\partial y} - \lambda\left(\frac{\partial B(x,y)}{\partial y}\right) = 0$$

$$\frac{\partial L}{\partial \lambda} = \frac{\partial U(x,y)}{\partial \lambda} - \lambda\left(\frac{\partial B(x,y)}{\partial \lambda}\right) = 0$$

Step 2

① $2y - \lambda(4) = 0$

② $2x - \lambda(6) = 0$

③ $4x + 6y = 72$

นำ ③ − 2②; $(4x+6y) - (4x - 12\lambda) = 72$

$$\longrightarrow \begin{cases} 6y + 12\lambda = 72 & \text{— ④} \\ 2y - 4\lambda = 0 & \text{— ①} \end{cases}$$

นำ ① + 3④; $\begin{cases} 6y + 12\lambda + 6y - 12\lambda = 72 \\ 12y = 72 \end{cases}$

$y = 6$

จาก $y = 6$ แทนใน ①; $2(6) - 4\lambda = 0$

$12 = 4\lambda$

$\lambda = 3$

จาก $\lambda = 3$ แทนใน ②; $2x - 6(3) = 0$

$x = 9$

Step 3

$\therefore (x, y, \lambda) = (9, 6, 3)$

4.)

Question 4: Cost minimization problem

Consider a cost minimization problem where firm chooses for optimal combination of capital (K) and labor (L). Suppose that r and w are the prices per unit of capital and labor, respectively. And assume further that the production technology of this firm is given by $\sqrt{K} + L = Q$. Consider the following problem

a. Solve for the optimal combination of capital and labor.
b. State the condition under which both types of factor inputs are used by firm.
c. Derive the cost function.

Total cost equation $C = Kr + Lw$

$\mathcal{L} = kr + Lw + \lambda b - \lambda k^{\frac{1}{2}} - \lambda L$

$\frac{\partial \mathcal{L}}{\partial L} = w - \lambda = 0$

$\frac{\partial \mathcal{L}}{\partial K} = r - \frac{1}{2}\lambda k^{-\frac{3}{2}} = 0$

$\frac{\partial \mathcal{L}}{\partial \lambda} = k^{\frac{1}{2}} + L = 0$

(a) $L = -k^{\frac{1}{2}}$

(b) $Q = L + k^{\frac{1}{2}}$
$Q = -k^{\frac{1}{2}} + k^{\frac{1}{2}}$
$Q = 0$

(c) $C = k(-k^{-\frac{3}{2}})\lambda + -k^{\frac{1}{2}}\lambda$