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Question 1

(a)

$$L = (Q - K_0)^2$$

- Labour is independent from w, r and increases with Q increasing.

(b)

$$SRTC = w(Q - K_0)^2 + rK_0$$

- SRTC increases with Q, or w, or r increase

(c)

$$\underset{L,K}{min} LRTC = wL + rK$$

s.t

$$Q = \sqrt{L} + K$$

Tangency condition:

$$\frac{1}{2\sqrt{L}} = \frac{w}{r}$$

$$L = (\frac{r}{2w})^2$$

$$K = Q - \frac{r}{2w}$$

(d) As Q increases, K increases and L is constant.
- L is not normal input.
- K is a normal input.

2.

a) $\min_{L,K} LRTC = wL + rK$

subject to $Q = 80\sqrt{LK}$

tangency condition:

$$\frac{MP_L}{MP_K} = \frac{w}{r}$$

$$\frac{25\sqrt{\frac{K}{L}}}{25\sqrt{\frac{L}{K}}} = \frac{25}{100}$$

$$L = 4K$$

$\therefore$ sub $L = 4K$,

$$Q = 80\sqrt{4K^2}$$

$$K = \frac{Q}{100}$$

$$L = \frac{Q}{25}$$

$LRTC = wL + rK$

$= 25L + 100K$

$= 2Q$

$LARTC = 2$

b) $L = \frac{Q^2}{2500k}$

$SRTC = wL + rk$

$= 25L + 100\bar{k}$

$= \frac{Q^2}{100\bar{k}} + 100\bar{k}$

$SRATC = \frac{SRTC}{Q} = \frac{Q}{100\bar{k}} + \frac{100\bar{k}}{Q}$

c) $SRATC = \frac{Q}{100} + \frac{100}{Q}$

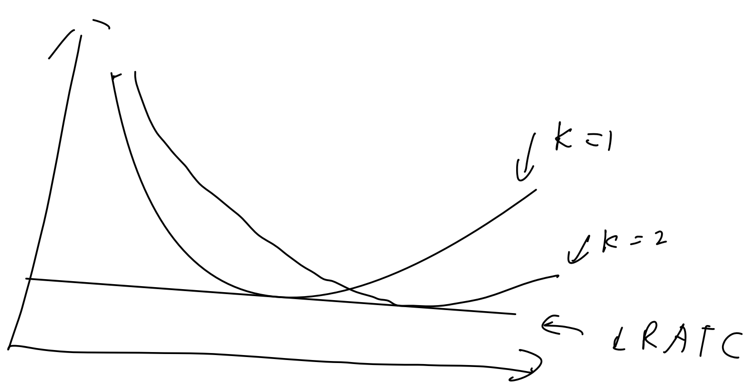
$\frac{dSRATC}{dQ} = 0$

$\frac{1}{200} - \frac{200}{Q^2} = 0$

$Q = 200$

$SRATC = 2 = LRATC$

$\therefore$ $Q = 200$ SRATC is tangent to LRATC



Question 3

(a) LRTC minimizing problem

$$\min_{L,K} LRTC = wL + rK$$

s.t.

$$Q = L + K$$

We have:

$$\frac{MP_L}{p_L} = \frac{1}{1}$$

$$\frac{MP_K}{p_K} = \frac{1}{2}$$

$$\Rightarrow \frac{MP_L}{p_L} > \frac{MP_K}{p_K}$$

Therefore, to minimize cost, SFA has to only buy labour with no capital

$$\begin{cases} L & = Q \\ K & = 0 \end{cases}$$

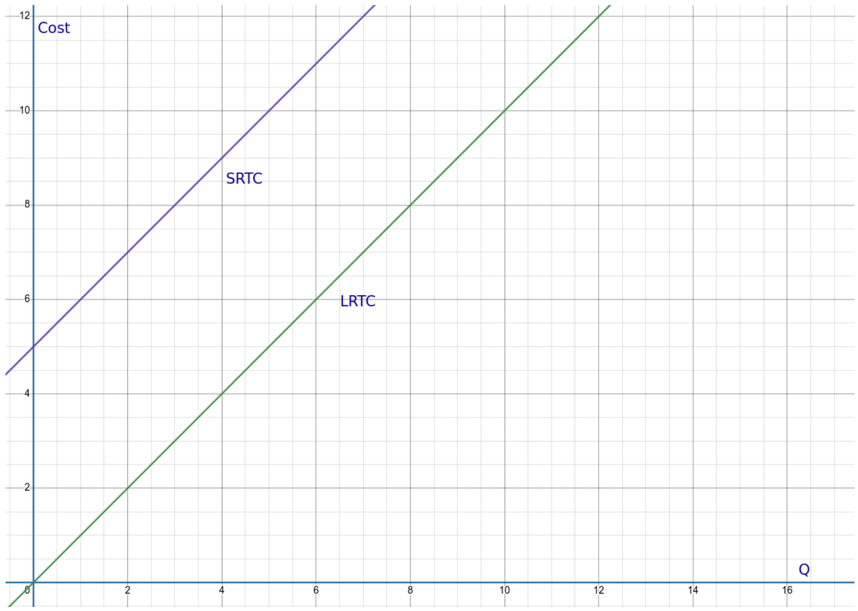
$$LRTC = L = Q$$

(b)

$$\begin{cases} Q < 5 & L = 0 \\ Q \geq 5 & L = Q - 5 \end{cases}$$

$$\begin{cases} Q < 5 & SRTC = 10 \\ Q \geq 5 & SRTC = Q + 5 \end{cases}$$

(c)


Cost
SRTC
LRTC
Q
12
10
8
6
4
2
0
2
4
6
8
10
12
14
16

4)