Q1.

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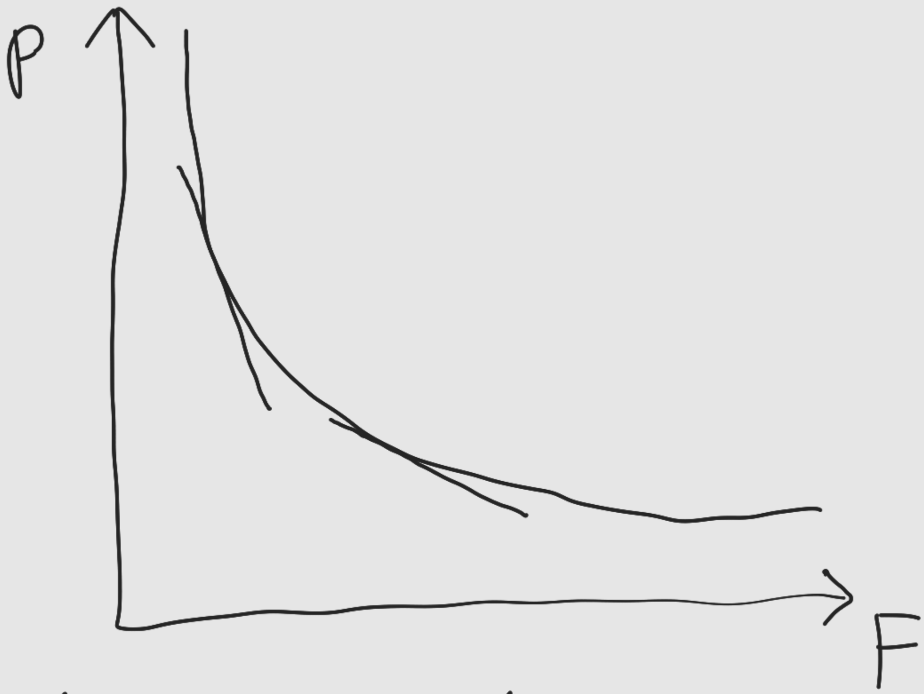
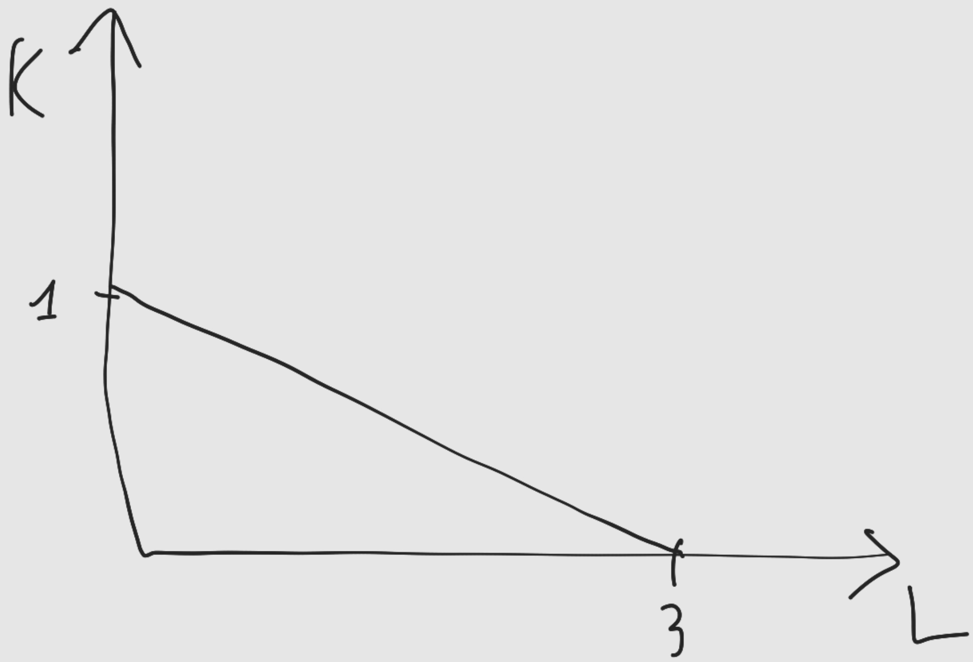
(a)



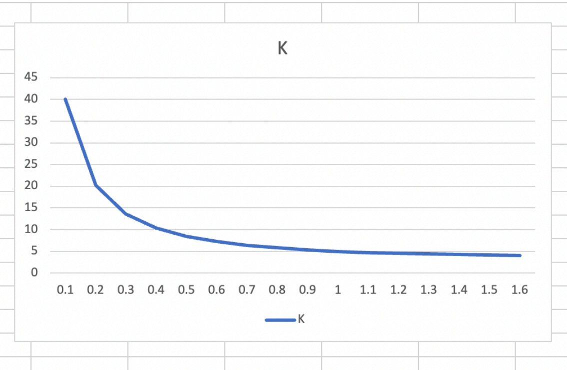
diminishing $MRS_{F,P}$

(b)



$MRS_{L,K} = \frac{1}{3}$ constant

Q2.



a) $KL - L^2 = 4$

$$K = L + \frac{4}{L}$$

$$\frac{dK}{dL} = 0$$

$$1 - \frac{4}{L^2} = 0$$

$$4 = L^2$$

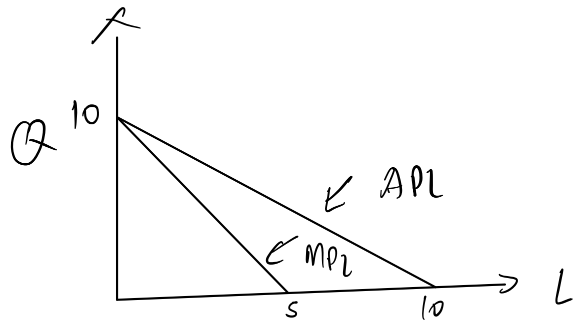
$$L = 2$$

The uneconomic region of production occurs where $L > 2$

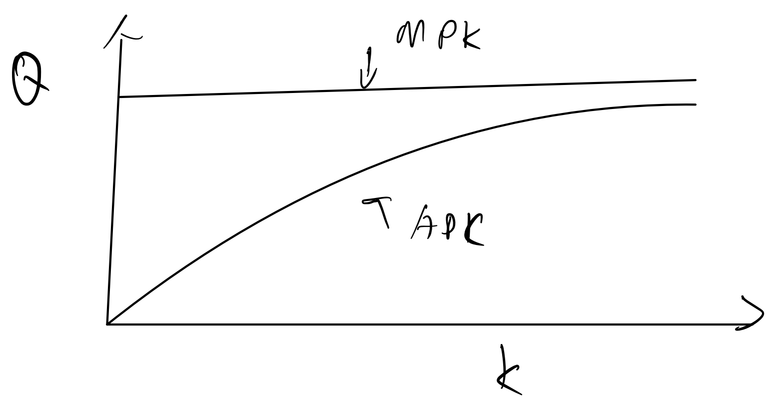
$MP_L = K - 2L$, negative when $K < 2L$.

$MP_K = L$, since $L \geq 0$, MP_K never negative

b) $K=10$, $MP_L = \frac{dQ}{dL} = K - 2L = 10 - 2L$ and $AP_L = \frac{KL - L^2}{L} = 10 - L$



c) $L=10$, $MP_K = \frac{dQ}{dK} = L = 10$, $AP_K = \frac{KL - L^2}{K} = 10 - \frac{100}{K}$



Q3. - For $Q^I = \sqrt{KL}$ (Cobb-Douglas)

(a+b)

$$\Rightarrow MRST^I_{L,K} = \frac{K}{L}$$

- For $Q^N = KL$ (Cobb-Douglas)

$$\Rightarrow MRST^N_{L,K} = \frac{K}{L} = MRST^I_{L,K}$$

- We have: $Q^N > Q^I$ & $MRST^I_{L,K} = MRST^N_{L,K}$

$\Rightarrow$ This is a neutral tech progress

(c) $Q = AK^{\alpha}L^{\beta}$

$$Q' = A(kK)^{\alpha}(kL)^{\beta}$$

$$= aK^{\alpha}L^{\beta}k^{\alpha+\beta}$$

$$\Rightarrow \frac{Q'}{Q} = k^{\alpha+\beta}$$

$$\Rightarrow \begin{cases} \text{incr r.o.c if } \alpha+\beta > 1 \\ \text{const r.o.c if } \alpha+\beta = 1 \\ \text{decr r.o.c if } \alpha+\beta < 1 \end{cases}$$

(d) $Q = \sqrt{KL}$ ⇒ const r.o.c

$Q = KL$ ⇒ icr r.o.c

4) a) At $Q=10$

$FC = 3000 \times 10$

$= 30{,}000$

$\therefore$ At $Q=2$ FC is same.

$VC(Q) = 35{,}000 - 30{,}000 = 5000$

$AVC(Q) = \frac{VC}{Q} = \frac{5{,}000}{2}$

$= 2500$

b) $Q=5$, $AFC(Q) = \frac{FC}{Q}$

$= \frac{30000}{5}$

$= 6000$

Q5.

(a) $Q = L + K$

$3 = L + 2$

$\underline{L = 1}$

$SRTC = L + 2K$

$= 1 + 2 \cdot 2 = 5$

$SRTC(Q) = L + 2K$

$= (Q - K) + 2K$

$= Q + K$

(b) $Q = \min\{L, K\}$

$1 = \min\{L, 2\}$

$\Rightarrow \underline{L = 1}$

$SRTC = L + 2K = 5$

$$Q = \min\{L, K\}$$

$$\Rightarrow \min L = Q$$

(As this is cost-minimizing process, the less L the better)

$$\Rightarrow L = Q$$

- We have:

$$SRTC = L + K$$
$$= Q + K$$

6) a) $Q = 5\sqrt{L}$

$L = \frac{Q^2}{25}$

SRT $C(Q) = wL + rK$

$= 25\left(\frac{Q^2}{25}\right) + 20 \cdot 5$

$= 100 + Q^2$

b) SRATC $(Q) = \frac{SRTC}{Q}$

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

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

SRM C$(Q) = \frac{dSRTC}{dQ}$

$= 2Q$

AVC$(Q) = \frac{VC}{Q} = \frac{Q^2}{Q} = Q$

AFC$(Q) = \frac{FC}{Q} = \frac{100}{Q}$

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

$-\frac{100}{Q^2} + 1 = 0$

$Q^2 = 100$

$Q = 10$

AT $Q = 10$

$SRATC = SRMC = 20$