

Week 15 习题1.

(A) $b_0 - 2q = 30 \Rightarrow q = 15 \Rightarrow P = 45 \Rightarrow \pi = 45 \times 15 - 30 \times 15 = 225 = PS.$

$CS = 15 \times 15 / 2 = 112.5, TS = 225 + 112.5 = 337.5, DWL = 112.5$

(B) $b_0 - q = 30 \Rightarrow q = 30 \Rightarrow \pi = 30 \times 30 / 2 = 450, CS = 0, TS = 0 + 450 = 450, DWL = 0.$

(C) $\pi = P(q_1)q_1 + P(q_2)(q_2 - q_1) - TC(q_2) = (60 - q_1)q_1 + (60 - q_2)(q_2 - q_1) - 30q_2 = -q_1^2 - q_2^2 + 30q_2 + q_1q_2.$

一阶条件: $-2q_1 + q_2 = 0, -2q_2 + 30 + q_1 = 0 \Rightarrow$ 联立求解: $q_1 = 10, q_2 = 20.$

对应的价格为 $P_1 = 50, P_2 = 40 \Rightarrow \pi = 50 \times 10 + 40 \times (20 - 10) - 30 \times 20 = 300.$

$CS = (10 \times 10 / 2) + (10 \times 10 / 2) = 100, TS = 100 + 300 = 400, DWL = 450 - 400 = 50.$

(D) $\pi = P(q_1)q_1 + P(q_2)(q_2 - q_1) + P(q_3)(q_3 - q_2) - TC(q_3).$

$= (60 - q_1)q_1 + (60 - q_2)(q_2 - q_1) + (60 - q_3)(q_3 - q_2) - 30q_3.$

$= -q_1^2 - q_2^2 - q_3^2 + 30q_3 + q_1q_2 + q_2q_3.$

一阶条件: $-2q_1 + q_2 = 0, -2q_2 + q_1 + q_3 = 0, -2q_3 + 30 + q_2 = 0.$

\Rightarrow 联立求解: $q_1 = 7.5, q_2 = 15, q_3 = 22.5$

对应的价格为 $P_1 = 52.5, P_2 = 45, P_3 = 52.5.$

$\Rightarrow \pi = 52.5 \times 7.5 + 45 \times (15 - 7.5) + 52.5 \times (22.5 - 15) - 30 \times 22.5$

$= 337.5$

$CS = (7.5 \times 7.5 / 2) + (7.5 \times 15 / 2) + (7.5 \times 15 / 2) = 843.75$

$TS = 843.75 + 337.5 = 1181.25$

$DWL = 450 - 1181.25 = -731.25$