

1.

$$2. \begin{cases} P = 100 - q_A \\ P = 80 - q_B \end{cases} \Rightarrow \begin{cases} q_A = 100 - P \\ q_B = 80 - P \end{cases}$$

$$Q = q_A + q_B = 180 - 2P \text{ 市場需求}$$

$$\begin{aligned} \pi_V &= TR - TC \\ &= P(Q) \times Q - TC(Q) \end{aligned}$$

$$= (90 - 0.5Q) \times Q - 20Q$$

$$\frac{d\pi_V}{dQ} = 0 \Rightarrow Q^* = 90 - Q - 20 = 70$$

$$P^* = 55, Q^* = 70$$

$$\pi_V^* = 55 \times 70 - 20 \times 70 = 2450$$

$$CS = CS_A + CS_B$$

$$CS_A = \frac{1}{2} (100 - 55) \times 45 = 1012.5$$

$$CS_B = \frac{1}{2} (80 - 55) \times 25 = 312.5$$

$$CS = 1012.5 + 312.5 = 1325$$

$$SW = PS + CS = 1325 + 2450 = 3775$$

$$3. F = (80 - P) \times \frac{1}{2} = (80 - P)(80 - P)/2 = \frac{(80 - P)^2}{2}$$

$$\pi_V = 2F + (P - 20)(q_A + q_B) = (80 - P)^2/2 + (P - 20) \times (180 - 2P)$$

$$\pi_V = -P^2 + 60P + 28000$$

$$\text{由一階條件 } P = 30, F = 1250, Q = 120, \pi_V = 37$$

$$CS = CS_A(P=30) + CS_B(P=30) - 2F$$

$$= 2450 + 1250 - 2500 = 1200$$

$$TS = CS + PS = 1200 + 3700 = 4900$$