$$\Pi = TR - TC$$

FOC

$$\frac{d\Pi(\cdot)}{dQ} : \frac{dTR}{dQ} - \frac{dTC}{dQ} = 0$$

$$MR - MC = 0$$

$$\boxed{MR = MC}$$

$$TR = P \cdot Q$$

$$\Delta TR = \overbrace{P_1 Q_1}^{TR_1} - \overbrace{P_0 Q_0}^{TR_0}$$

P constant in PC $P_0 = P_1 = P$

$$\Delta TR = P Q_1 - P Q_0 = P(Q_1 - Q_0)$$
$$= P \cdot \Delta Q$$

$$ATC = \frac{TC}{Q}$$

$$TC = ATC * Q$$

$$TC = 3Q^3 - 18Q^2 + 30Q + 50$$

$$ATC = \frac{TC}{Q} = 3Q^2 - 18Q + 30 + \frac{50}{Q}$$

$$MC = \frac{d\,TC(Q)}{dQ} = 3(3)Q^{3-1} - 2(18)Q^{2-1} + 30$$

$$MC = 9Q^2 - 36Q + 30$$

$$AVC = \frac{VC}{Q} = \frac{3Q^3 - 18Q^2 + 30Q}{Q}$$

$$AVC = 3Q^2 - 18Q + 30$$

$$PS = TR - VC = PQ - AVC \cdot Q$$

$$PS = (P - AVC) * Q$$

$$3Q^2 - 18Q + 30 = 9Q^2 - 36Q + 30$$

$$9Q^2 - 3Q^2 = 36Q - 18Q$$

$$6Q^2 = 18Q$$

$$Q^2 = \frac{18}{6}Q \qquad \Rightarrow Q = 3$$