Example 2.I: A monopolist firm faces the market demand given by P = 10 - Q. Consider the following questions if the cost function C(Q) = 4Q.

note : Monopolist → 7 unit → 8 \$
5 " → 5 \$
3 " → 7 \$

- What is the revenue-maximizing level of output? Q maximize revenue

Find revenue function → R(Q)

R(Q) = (price per unit) × (unit of output)

= P × Q

↳ P(Q) is market demand

= (10 - Q)Q = 10Q - Q² → revenue f^n is " quadratic function "

then, = $\frac{-b}{2a}$ → Q = $\frac{-10}{2(-1)}$ = 5 units → Calculate the level of maximized revenue ?

= R(Q) = 10(5) - (5)² = 50 - 25 = 25 *

- What is the break-even output?

Break - even output (π = 0)

this means " Q " ensure sufficient level of revenue to cover the cost → { R = C ; π = 0 }

π = R - C

= (10Q - Q²) - (4Q) = 10Q - Q² - 4Q

= 6Q - Q² ; π(Q) = 0

6Q - Q² = 0

Q(6 - Q) = 0 → Q = 0, 6

- What is the profit-maximizing level of output?

π(Q) = 6Q - Q²

a = -1 ; b = 6, c = 0

[Q] : $\frac{-b}{2a}$ → $\frac{-6}{2(-1)}$ = 3 units

note : another advance approach

$\frac{d\pi}{dQ} = 0 \rightarrow Q^*$

from $Q^* \rightarrow \frac{d^2\pi}{dQ^2} < 0 \Big|_{Q = Q^*}$

- maximized profit : π(3) = 6(3) - 3² = 18 - 9 = 9
- price that monopolist should change → plus (+) Q = 3 into the market demand

P = 10 - Q = 10 - 3 = 7 \$ / unit