

$\underline{\text{Exp}}(\text{cost}) \quad \overline{MC} = 3\sqrt{2x+25} \quad x: \# \text{ of units}$

Fixed cost is \$11,125

- ① Find total cost
- ② Find total cost when 300 units are produced

$$C(x) = \int \overline{MC} \, dx = \int 3\sqrt{2x+25} \, dx$$

$$= 3 \int (2x+25)^{\frac{1}{2}} dx$$

$$= 3 \int (y)^{\frac{1}{2}} \frac{dy}{2}$$

$$= \frac{3}{2} \int y^{\frac{1}{2}} dy$$

$$= \frac{3}{2} \frac{y^{\frac{1}{2}+1}}{\frac{1}{2}+1} + K$$

$$= \frac{3}{2} \frac{y^{\frac{3}{2}}}{\frac{3}{2}} + K$$

$$= \frac{3}{4} y^{\frac{3}{2}} + K$$

$$y = 2x + 25$$

$$y' = 2$$

$$\frac{dy}{dx} = 2$$

$$dy = 2 \, dx$$

$$\frac{dy}{2} = dx$$

مکمل

$$C(x) = \frac{3}{2}x + k$$

$$C(x) = (2x + 25)^{\frac{3}{2}} + k$$

$$C(0) = 11,125$$

$$(2(0) + 25)^{\frac{3}{2}} + k = 11,125$$

$$(25)^{\frac{3}{2}} + k = 11,125$$

$$\left(\frac{3}{2} \cdot 2\right) \cdot 5^2 + k = 11,125$$

$$125 + k = 11,125$$

$$\frac{3}{2} = 5 \cdot 5 \cdot 5 = 125$$

$$k = 11,000$$

Total cost

$$C(x) = (2x + 25)^{\frac{3}{2}} + 11,000$$

⑦

$$C(300) = (2(300) + 25)^{\frac{3}{2}} + 11,000$$

$$= (600 + 25)^{\frac{3}{2}} + 11,000$$

5	625
5	125
5	25
5	5
5	1

$$= (600 + 25)^2 + 11000$$

$$= (625)^2 + 11000$$

$$= (5)^{\frac{3}{2}} + 11000$$

$$\frac{3}{2} \cdot \frac{2}{4}$$

$$= 5^6 + 11000$$

$$= 15,625 + 11000$$

$$= \$26,625$$

Exp (Profit)

$$\checkmark \quad \overline{MR} = 200 - 4x$$

$$\checkmark \quad \overline{MC} = 50 + 2x$$

$$C(10) = 700$$

total cost of producing 10 units is \$700

① what level should the firm hold production to maximize profit.

$$P(x) = R(x) - C(x)$$

Total Profit Total Revenue Total cost

$$P'(x) = R'(x) - C'(x)$$

$$= \overline{MR} - \overline{MC}$$

$$x=30 \Rightarrow \hat{P}(30) = 150 - 180 < 0$$

$$\begin{aligned} &= (200 - 4x) - (50 + 2x) \\ &= 200 - 4x - 50 - 2x \end{aligned}$$

$$\hat{P}'(x) = 150 - 6x = 0$$

$$150 - 6x = 0$$

$$150 = 6x$$

$$\frac{150}{6} = x$$

$$x = 25$$

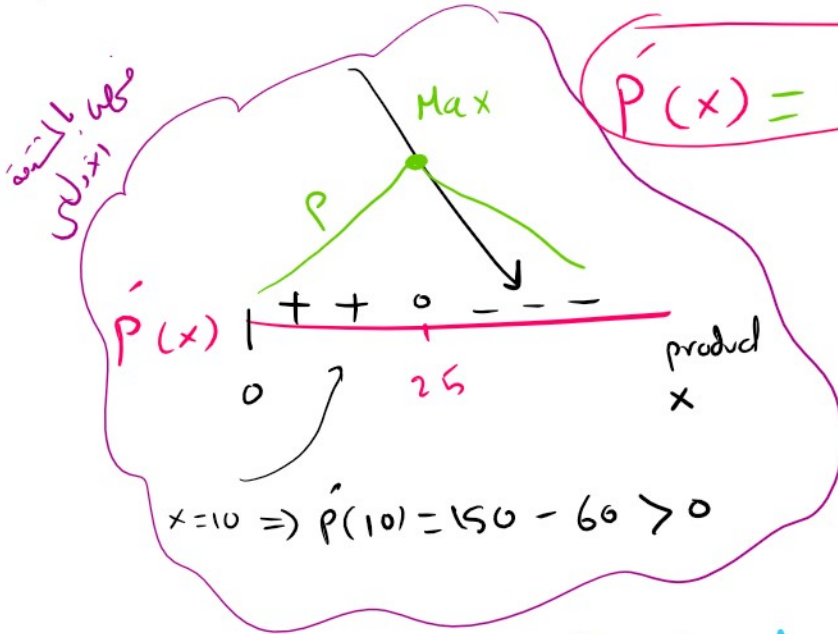
critical value for profit

$$\hat{P}''(x) = -6$$

$$\hat{P}''(25) = -6 < 0$$

Max

القيمة المثلى



The firm should hold the level $x=25$
since this level gives Max profit.

② Find Max Profit

We need to find $P(25)$??

$$P(x) = R(x) - C(x)$$

$$= \int \overline{MR} dx - \int \overline{MC} dx$$

$$= \int (200 - 4x) dx - \int (50 + 2x) dx$$

$$= 200x - 4 \frac{x^2}{2} + C_1 - \left[50x + 2 \frac{x^2}{2} + C_2 \right]$$

$$R(x) = Px$$

$$R(0) = 0$$

$$200(0) - 2(0)^2 + C_1 = 0$$

$$0 - 0 + C_1 = 0$$

$$C_1 = 0$$

$$P(x) = 200x - 2x^2 + C_1$$

$$R(0) = 0$$

$$- \left[50x + x^2 + C_2 \right]$$

$$C(10) = 700$$

$$50(10) + 10^2 + C_2 = 700$$

$$500 + 100 + C_2 = 700$$

$$600 + C_2 = 700$$

$$C_2 = 100$$

$$P(x) = 200x - 2x^2 + 0 - [50x + x^2 + 100]$$

$$= 200x - 2x^2 - 50x - x^2 - 100$$

$$P(x) = -3x^2 + 150x - 100$$

$$P(25) = -3(25)^2 + 150(25) - 100$$

$$= -3(625) + 3750 - 100$$

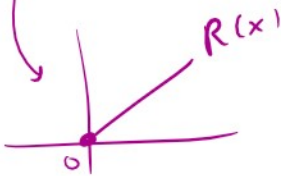
$$= -1875 + 3750 - 100$$

$$= \$1775$$

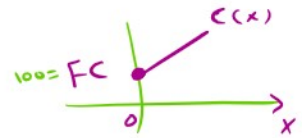
$$= \$ 1 + + \dots$$

$$R(x) = p(x)$$

$$R(0) = 0$$



$$C(x) \Rightarrow C(0) = \text{Fixed cost} = FC$$



$$P(x) = R(x) - C(x)$$

$$P(0) = R(0) - C(0)$$

$$= 0 - FC$$

$$P(0) = -FC$$

$\Rightarrow$

$$P'(x) = 150 - 6x$$

$$P(x) = \int P'(x) dx = \int (150 - 6x) dx$$

$$= 150x - 6 \frac{x^2}{2} + C$$

$$P(x) = 150x - 3x^2 + C$$

$$P(0) = 150(0) - 3(0)^2 + C$$

$$-FC = 0 - 0 + C$$

$$-FC = C$$

$$-FC = C$$

$$P(x) = 150x - 3x^2 - FC$$

$$-FC = -100$$

$$FC = 100$$

Ex 1 (Av. Cost)

Given $\bar{C}'(x) = \frac{-10}{x^2} + \frac{1}{10}$

average cost of 10 units is \$20

$$\bar{C}(10) = 20$$

① Find average cost

② " " " for producing 20 units

$$\bar{C}(x) = \int \bar{C}'(x) dx = \int \left(\frac{-10}{x^2} + \frac{1}{10} \right) dx$$

$$= \int \left(-10x^{-2} + \frac{1}{10} \right) dx$$

$$\bar{C}(x) = -10 \frac{x^{-1}}{-1} + \frac{1}{10}x + K$$

$$\bar{C}(x) = \frac{10}{x} + \frac{x}{10} + K$$

$$\text{but } \bar{C}(10) = 20$$

$$\bar{C}(x) = \frac{10}{x} + \frac{x}{10} + K \quad \text{but } \bar{C}(10) = 20$$

$$\bar{C}(10) = \frac{10}{10} + \frac{10}{10} + K$$

$$20 = 1 + 1 + K$$

$$18 = K$$

$$\bar{C}(x) = \frac{10}{x} + \frac{x}{10} + 18$$

②

$$\begin{aligned}\bar{C}(20) &= \frac{10}{20} + \frac{20}{10} + 18 \\ &= 0.5 + 2 + 18 \\ &= \$ 20.5\end{aligned}$$

③ Find Total cost

$$C(x) = x \bar{C}(x)$$

$$= x \left[\frac{10}{x} + \frac{x}{10} + 18 \right]$$

Total Cost
↓

$$\bar{C}(x) = \frac{C(x)}{x}$$

$$= x \left(\frac{10}{x} + \frac{1}{10} + 10 \right)$$

$$C(x) = 10 + \frac{x^2}{10} + 18x$$

(4) Find total cost of producing 10 units

$$C(10) = 10 + \frac{10^2}{10} + 18(10)$$

$$= 10 + 10 + 180$$

$$= \$ 200$$