

Assignment 2

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Question 21(a) A product can be manufactured at a total cost $C(x) = \frac{x^2}{100} + 100x + 40$, where x is the number of units produced. The price at which each unit can be sold is given by $P = 200 - \frac{x}{400}$. Determine the production level x at which the profit is maximum. What is the price per unit and total profit at the level of production?

Solution. Let the total price $p(x) = P \cdot x$

$$\Rightarrow \frac{p(x)}{x} = 200 - \frac{x}{400} \quad (1)$$

$$c(x) = \frac{x^2}{100} + 100x + 40 \quad (2)$$

$$Profit = p(x) - c(x) \quad (3)$$

For maximum profit $\frac{dProfit}{dx} = 0$

$$\Rightarrow 100 - \frac{x}{40} = 0 \quad (4)$$

$$\Rightarrow x = 4000 \quad (5)$$

The total production level $x = 4000$

Price per unit = $P(x) = 190$

$$Profit = 199960 \quad (6)$$

Total profit = 199960

Symbol	Description	Value
x	Number of units	4000
P	Price per unit	190
$P(x)$	Total price	760000
$C(x)$	Total cost	560040
$Profit$	Total profit	199960

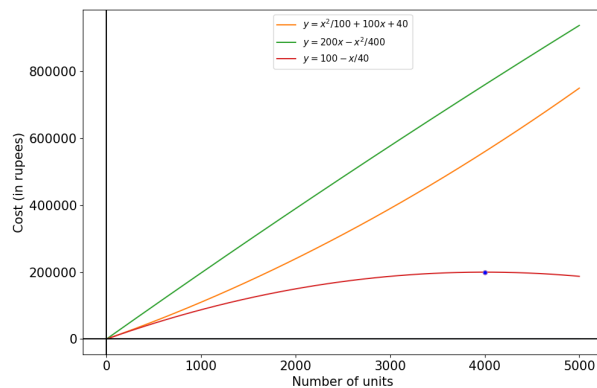


Fig. 1. Graph shows Total Profit, Total cost, Total profit with x