

# 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.**

$$\text{Let the total price } p(x) = P \cdot x \quad (1)$$

$$\Rightarrow \frac{p(x)}{x} = 200 - \frac{x}{400} \quad (2)$$

$$c(x) = \frac{x^2}{100} + 100x + 40 \quad (3)$$

$$\text{Profit} = p(x) - c(x) \quad (4)$$

For maximum profit  $\frac{d\text{Profit}}{dx} = 0$

$$\Rightarrow 100 - \frac{x}{40} = 0 \quad (5)$$

$$\Rightarrow x = 4000 \quad (6)$$

The total production level  $x = 4000$ .

$$\text{Price per unit} = P(x) = 190 \quad (7)$$

$$\text{Profit} = 199960 \quad (8)$$

Total profit = 199960

Symbol	Description	Value
$P$	Price per unit	190
$P(x)$	Total price	760000
$C(x)$	Total cost	560040
$\text{Profit}$	Total profit	199960

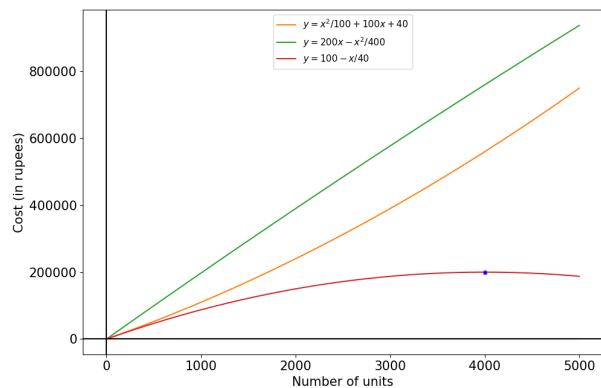


Fig. 1. Graph shows Total Profit, Total cost, Total profit with  $x$