

# ICSE 2017 Q8 b

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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  $p(x) = P \cdot x$

$$\Rightarrow \frac{p(x)}{x} = 200 - \frac{x}{400} \quad (0.1)$$

$$c(x) = \frac{x^2}{100} + 100x + 40 \quad (0.2)$$

$$Profit = p(x) - c(x) \quad (0.3)$$

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

$$\Rightarrow 100 - \frac{x}{40} = 0 \quad (0.4)$$

$$\Rightarrow x = 4000 \quad (0.5)$$

The total production level  $x = 4000$

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

$$Profit = 199960 \quad (0.6)$$

Total profit = 199960

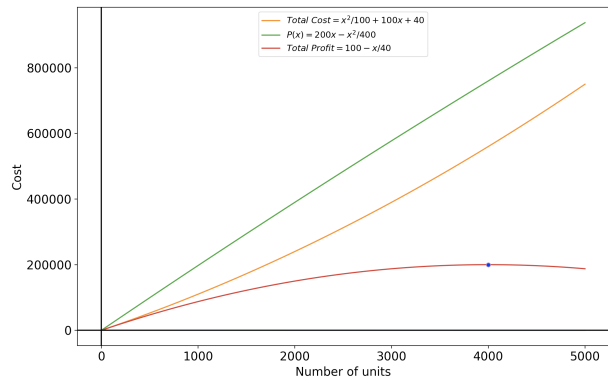


Fig. 0.1. Graph shows Total Profit, Total cost, Total profit with  $x$

Symbol	Value	Description
$x$	4000	Number of Units
$P(x)$	760000	Total Price
$P$	190	Price per unit
$C(x)$	560040	Total Cost
$Profit$	199960	Total Profit