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.

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

$$\implies \frac{p(x)}{x} = 200 - \frac{x}{400} \qquad (2)$$

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

$$Profit = p(x) - c(x) \qquad (4)$$

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

$$\implies 100 - \frac{x}{40} = 0 \qquad (5)$$
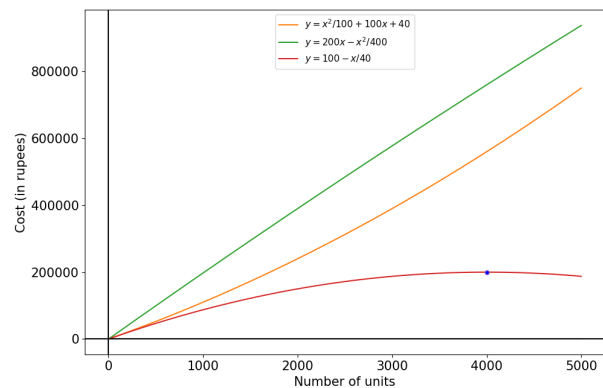
$$\implies x = 4000 \qquad (6)$$

The total production level $x = 4000$.

$$Price\ per\ unit = \frac{c(x)}{x} = 190 \qquad (7)$$

$$p(x) = 199960 \qquad (8)$$

Total profit = 199960

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