

A1110 Assignment 2

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Q21(b): A manufacturer's marginal cost function is $\frac{500}{\sqrt{2x+25}}$. Find the cost involved to increase production from 100 units to 300 units.

Solution:

TABLE I
TABLE WITH INPUT AND OUTPUT VARIABLES, THEIR SYMBOLS, THEIR FORMULAE AND VALUES:

Description	Symbol	Formula	Value
No of units	x	-	-
Initial units	a	-	100
Final units	b	-	300
Marginal Cost function	F(x)	$\frac{500}{\sqrt{2x+25}}$	-
Cost to increase production from a to b	C	$\int_a^b F(x) dx$?

From the table we have cost involved to increase production from a units to b units

$$C = \int_a^b F(x) dx \quad (1)$$

where $F(x)dx$ is the cost involved in changing production by dx units. Hence for a to b we integrate $F(x)$ from a to b units

$$\Rightarrow C = \int_a^b \frac{500}{\sqrt{2x+25}} dx \quad (2)$$

$$= 500 \int_a^b \frac{1}{\sqrt{2x+25}} dx \quad (3)$$

$$\text{Let, } 2x + 25 = t, 2dx = dt \quad (4)$$

$$\Rightarrow C = 500 \int_{2a+25}^{2b+25} \frac{1}{\sqrt{t}} \frac{dt}{2} \quad (5)$$

$$= \frac{500}{2} \int_{2a+25}^{2b+25} \frac{1}{\sqrt{t}} dt \quad (6)$$

$$= \frac{500}{2} \left[2\sqrt{t} \right]_{2a+25}^{2b+25} \quad (7)$$

$$= 500 \left[\sqrt{t} \right]_{2a+25}^{2b+25} \quad (8)$$

$$= 500(\sqrt{2b+25} - \sqrt{2a+25}) \quad (9)$$

$$\text{Now, } a = 100 \text{ units, } b = 300 \text{ units} \quad (10)$$

$$\Rightarrow C = 500(\sqrt{2 \times 300 + 25} - \sqrt{2 \times 100 + 25}) \quad (11)$$

$$= 500 \times (\sqrt{625} - \sqrt{225}) \quad (12)$$

$$= 500 \times (25 - 15) = 5000 \quad (13)$$

$$\Rightarrow C = \text{Rs.}5000 \quad (14)$$

Hence cost involved to increase production from 100 units to 300 units is Rs.5000.