

6. The demand function for a brand of blank digital camcorder tapes is given by $p = -0.01x^2 - 0.2x + 23$, where p is the unit price in dollars and x is the quantity demanded each week, measured in units of a thousand. Determine the consumers' surplus if the unit price is \$8/tape. (5 marks)

Answer

CS = \$270,000

Explanation

let $p = \$8$

CS = consumers surplus

Required ;

CS = ?

Solution :

$$p = -0.01x^2 - 0.2x + 23$$

$$8 = -0.01x^2 - 0.2x + 23$$

$$-0.01x^2 - 0.2x + 15 = 0$$

; Find the roots of x

$$x = 0.2 \pm \sqrt{((-0.2)^2 - (4 \cdot 0.01 \cdot 15)) / 2 \cdot -0.01}$$

$$= (0.2 \pm 0.8) / -0.02$$

$$x_1 = (0.2 + 0.8) / -0.02$$

$$= -50$$

$$x_2 = (0.2 - 0.8) / -0.02$$

$$x_2 = 30$$

; Discard negative root,

Solve for consumer's surplus ,CS

$$CS = \int_{0.2}^{30} (-0.01x^2 - 0.2x + 23) dx - 30 \cdot 8$$

$$= - \int_{0.2}^{30} 0.01 dx - 0.2 \int_{0.2}^{30} x dx + 23 \int_{0.2}^{30} dx - 240$$

$$= 0.01/3 (30^3 - 0.2^3) - 0.2/2 (30^2 - 0.2^2) + 23(30 - 0.2) - 240$$

CS = 270 , since x is measured in thousands therefore ,

CS = \$270,000

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