

Calculus II, Section 8.4, #2  
Applications to Economics and Biology

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A company estimates that the marginal revenue (in dollars per unit) realized by selling  $x$  units of a product is  $48 - 0.0012x$ . Assuming the estimate is accurate, find the increase in revenue if sales increase from 5000 units to 10,000 units.<sup>1</sup>

We are given the marginal revenue, which is the rate of change of the revenue. We want the change in the revenue, so we will integrate the marginal revenue.<sup>2</sup>

The change in the revenue is given by

$$\begin{aligned} & \int_{x=5000}^{x=10,000} 48 - 0.0012x \, dx \\ &= \left[ 48x - 0.0012 \cdot \frac{x^2}{2} \right]_{x=5000}^{x=10,000} \\ &= \left( 48 \cdot 10,000 - 0.0012 \cdot \frac{(10,000)^2}{2} \right) - \left( 48 \cdot 5000 - 0.0012 \cdot \frac{(5000)^2}{2} \right) \\ &= 420,000 - 225,000 \\ &= 195,000 \end{aligned}$$

Thus if the sales increase from 5000 to 10,000 units, the revenue will increase by \$195,000.

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<sup>1</sup>Stewart, *Calculus, Early Transcendentals*, p. 572, #2.

<sup>2</sup>In the Stewart calculus textbooks, the concept/theorem we are applying to this problem is called the Net Change Theorem.