Subject for this video: Computing Marginal Quantities

Reading:

- **General:** Section 2.7, Marginal Analysis
- **More Specifically:** Middle of page 162 – middle of page 164, parts of Examples 1,2

Homework:

Prerequisite Skills: Computing Marginal Quantities (2.7#9,13,17)

Business Terminology Introduced in Chapter 1

In the previous video, we discussed two terms called *Demand* and *Cost*. In today's video we will work also with *Revenue* and *Profit*, and with *Marginal Quantities*.

Business Terminology

Demand, x (small letter), is a variable that represents the number of items made. This sounds simple enough, but there can be complications. For example, in some problems, x represents the number of thousands of items made.

Cost, $C(x)$ (capital letter C), is a function that gives the cost of making the batch of x items.

Revenue, R (capital letter), is the amount of money that comes in from the sale of the x items that are made.

Profit, $P(x)$ (capital letter P), is a function defined as follows

$$Profit = Revenue - Cost$$

$$P(x) = R(x) - C(x)$$

The expression ***Marginal Quantity*** means *The Derivative of Quantity*. That is, **Marginal Revenue** is $R'(x)$, and **Marginal Cost** is $C'(x)$, and **Marginal Profit** is $P'(x)$.

[Example 1] Given $C(x) = 145 + 1.1x$ and $R(x) = 5x - 0.02x^2$.

(A) (Similar to 2.7#9) Find the marginal cost function.

Solution We are being asked to find $C'(x)$

$$C'(x) = \frac{d}{dx}(145 + 1.1x)$$

Sum and constant multiple rule

$$= \frac{d}{dx}145 + 1.1\frac{d}{dx}(x)$$

because $x = x^1$

Constant function rule

use power rule with $n = 1$

$$= (0) + 1.1(1 \cdot x^{1-1})$$

$$= 0 + 1.1x^0$$

$$= 1.1$$

(B) (Similar to 2.7#13) Find the marginal ~~cost~~ revenue function.

Solution We are being asked to find $R'(x)$

$$R'(x) = \frac{d}{dx}\left(5x - 0.02x^2\right)$$

Sum rule and constant multiple rule

$$= 5\cdot\frac{d}{dx}x - 0.02\frac{d}{dx}x^{2}$$

Power rule with $n=1$ Power rule with $n=2$

$$= 5\left(1\cdot x^{1-1}\right) - 0.02\left(2\cdot x^{2-1}\right)$$

$$= 5\cdot 1\cdot x^{0} - 0.02(2x^{1})$$

$$= 5\cdot 1\cdot 1 - 0.04x$$

$$= 5 - 0.04x$$

(C) (Similar to 2.7#17) Find the marginal profit function.

Solution Remember that Profit = Revenue − Cost

$$P(x) = R(x) - C(x)$$

So Marginal Profit is

$$P'(x) = \frac{d}{dx}\left(R(x) - C(x)\right)$$

Sum rule

$$= \frac{d}{dx}R(x) - \frac{d}{dx}C(x) = R'(x) - C'(x)$$

From part (B)

$$= (5 - 0.04x) - (1.1)$$

$$= 3.9 - 0.04x$$

End of [Example 1]

End of Video