Lesson 4 - Optimization in Economics

Rates of Change in Business and Economics

Business Functions

- The <u>demand function</u> or <u>price function</u>, p(x), is the price per unit that the market place is willing to pay for a given product or service at a production level of x units.
- The <u>revenue function</u> is R(x)=xp(x), where x is the number of units of a product or service sold at a price per unit of p(x).
- The <u>cost function</u>, C(x), is the total cost of producing x units of a product or service.
- The **profit function**, P(x), is the profit from the sale of x units of a product or service. P(x) = R(x) C(x)

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Derivatives of Business Functions

Economists use the word marginal to indicate the derivative of a business function.

C'(x) or
$$\frac{dC}{dx}$$

is the marginal cost function and refers to the instantaneous rate of change of total cost with respect to the number of items produced.

$$R'(x)$$
 or $\frac{dR}{dx}$

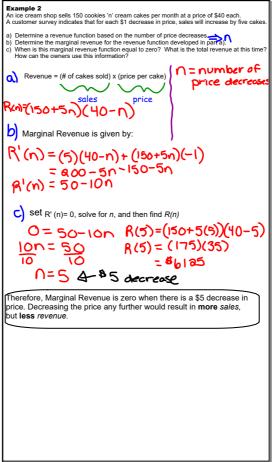
is the marginal revenue function and refers to the instantaneous rate of change of total revenue with respect to the number of items sold.

$$P'(x)$$
 or $\frac{dP}{dx}$

is the marginal profit function and refers to the instantaneous rate of change of total profit with respect to the number of items sold.

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Example 1: A company sells 1500 movie DVDs per month at $10 each. Market research he hown that sales will decrease by 125 DVDs per month for each $0.25 increase in price.
 own that sales will decrease by 125 DVDs per month for each $0.25 increase in price. Determine the demand (or price) function, (P_{CVE} = P_{CVE} + W_{CVE}^{\dagger}). Determine the marginal revenue when sales are 1000 DVDs per month. The cost of producing ± DVDs is (C_V) = -0.0044^2 + 9.2x + 5000. Determine the marginal cost when producion is 1000 DVDs per month. Determine the actual cost of producing the 1001 FVD. Determine the profit and marginal profit from the monthly sales of 1000 DVDs.
 Let n rep. the number of price increases
 et a rep. the number of DVD's sold.
 P = 10 + 0.2504 p(x) = 10 + 0.45 (1500 - x)
 X = 1500-1250
 195 192 P(x)=10+ 375-0.85x
                                    P(x)=1250+375-0.25x
                                    P(x)=1685-0.35X
                              · P(x)=13-0.002x
b) R(x) = DC (13-0.00ax)
 R'(x) = 13-2004x
R(1000)=13-0.004(1000)
= 13-4
= $9/44d
C) C(x)=-0.004x2+9.0x+5000
   C'(x)=-0.008x +9.2
   C'(1000) = - 0.008(1000)+9.2
                   =-8+9.2
=81,20/aud
d) c(1001) - C(1000) = [0.001 (1001) + 5000]
   -[-0.004(1000) +9.2(1000) +5000]
 = 10201.96 - 10á00
 = $ 1.196
e) Profit = R-C
P(x)=(13x-0.002x3)-(-0.004x3+9.2x+5000)
P(1000)=0.002x3+3.8x-5000
P(1000)=0.000(1000)+3.8(1000)-6000
               = 8 800
P'(1000) = 0.004x +3.8
               =0.004(1000)+38
=87.80/dvd
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