EECM 3714

Lecture 4: Unit 4

Differentiation

Renshaw, Ch. 6,8.4-10,13

04 March 2022

EXAMPLE 1

- Suppose that $y = (4x^2 - 3)(2x^5 + x)$
- Find $\frac{dy}{dx}$
- Solution
- Let $u = (4x^2 - 3)$ and $(2x^5 + x) = v$. Then $y = uv$
- So, use product rule: $y = uv \implies \frac{dy}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}$
- $\frac{du}{dx} = 8x$, $\frac{dv}{dx} = 10x^4 + 1$

$$\frac{dy}{dx} = (4x^2 - 3) \times (10x^4 + 1) + (2x^5 + x) \times 8x$$

$$\therefore \frac{dy}{dx} = (4x^2 - 3)(10x^4 + 1) + 8x(2x^5 + x)$$

MARGINAL REVENUE and MARGINAL COST, MC

- Recall that total revenue is $R = pq$.
- We often have to multiply demand curve/function by p (alternatively, multiply inverse demand curve/function by q) to obtain total revenue function
- MR = change in total revenue due to (one-unit/small) change in output/sales, i.e. extra
- Revenue from sale of extra item
- $MR = \frac{dR}{dq}$
- For perfectly competitive firm, $MR = p$
- Recall that total cost is $TC = f(q)$
- Note that total costs are equal to total fixed costs plus total variable costs, i.e. $C = TFC + TVC$
- Only TVC varies with q
- MC = change in total cost due to (one-unit/small) change in output/production, i.e. extra cost associated with production of extra item
- $MC = \frac{dC}{dq} \rightarrow MC = \frac{dTVC}{dq}$