
Math Review

Jugal Marfatia

January 9, 2019

Functions

In mathematics a function defines a relation involving one or more variables. A function takes an input (domain) and returns an output (range). Some examples of functions are

1. $f(x) = x^2 + 3$
2. Quantity Demanded, $Q^D = ap + c$,
where a and c are constants and p is the price.
3. Profit $\pi = \text{Total Revenue} - \text{Total Cost}$

Basic Calculus Derivative Notation

Let $f(x)$ be a function of one variable, therefore the first order (partial) derivative can be denoted in the following two way.

1. $f'(x)$
2. $\frac{\partial f(x)}{\partial x}$

Useful (Partial) Derivative Rules

Below are some of the basic derivative rules that we will be making use of in this class.

1. $\frac{\partial}{\partial x} c = 1$
2. $\frac{\partial}{\partial x} ax = a$

3. $\frac{\partial}{\partial x} x^n = nx^{n-1}$
4. $\frac{\partial}{\partial x} \log(x) = \frac{1}{x}$
5. $\frac{\partial}{\partial x} e^x = e^x$
6. $\frac{\partial}{\partial x} (f(x) + g(x)) = f'(x) + g'(x). \quad (\text{Sum Rule.})$
7. $\frac{\partial}{\partial x} (f(x) * g(x)) = f'(x) * g(x) + g'(x) * f(x). \quad (\text{Product Rule.})$
8. $\frac{\partial}{\partial x} \left(\frac{f(x)}{g(x)} \right) = \frac{f'(x) * g(x) - g'(x) * f(x)}{g(x)^2}. \quad (\text{Quotient Rule.})$

Examples of (Partial) Derivatives

Below are some example of (Partial) Derivatives using the above rules.

1. $\frac{\partial}{\partial x} 2x^2 + 4 = 4x$
2. $\frac{\partial}{\partial x} (x^3 * e^x) = 3x^2 * e^x + x^3 * e^x$
3. $\frac{\partial}{\partial x} \left(\frac{x^2 + 4}{x} \right) = \left(\frac{2x^2 - x^2 - 4}{x^2} \right) = \frac{x^2 - 4}{x^2}$