Bootcamp : Maths

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September 6, 2016

Contents

1 Session 1

1.1 Calculus

Calculus : study of changes.

2 types of calculus : differential and integral calculus.

Differential : distance $\rightarrow$ speed
Integration : speed $\rightarrow$ distance

1.1.1 Derivative

Definition
The derivative is the slope of the tangent line on a point.
Definition : The derivative of f at x_0 is the slope of the line tangent to the graph of f at x_0.

$$\lim_{\Delta x \to 0} ; \frac{f(x_0 + \Delta x) - f(x_0)}{\Delta x} = f'(x_0)$$

Some derivatives $f(x) = \frac{1}{x}(x > 0)$
$\frac{\Delta f}{\Delta x} = \frac{\frac{1}{x_0 + \Delta x} - \frac{1}{x_0}}{\Delta x} = -\frac{1}{x_0^2 + x_0 \Delta x}$

$$f'(x_0) = \lim_{\Delta x \to 0} ; -\frac{1}{x_0^2 + x_0 \Delta x} = -\frac{1}{x_0^2}$$

$$f(x) = x^n$$

$$f'(x) = \lim_{\Delta x \to 0} ; \frac{(x + \Delta x)^n - x^n}{\Delta x} = \lim_{\Delta x \to 0} ; \frac{\left(\binom{n}{0}x^n \Delta x^0 + \binom{n}{1}x^n \Delta x^1 + ...\right) - x^n}{\Delta x} = nx^{n-1}$$

Continuity

Derivatives of composed functions

Chain rules

Higher derivatives

Implicit differntiation

1.2   Differential equations

1.3   Linear Algebra