Maths Formula Sheet

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CHAPTER 16

Continuity and Differentiability

Continuity

$$f \text{ continuous at } a \iff \lim_{x\to a^-} f(x) = \lim_{x\to a^+} f(x) = f(a)$$

sums, products, quotients (denominator $\neq 0$) and compositions of continuous functions are continuous

INTERMEDIATE VALUE THEOREM

$$f \text{ continuous on } [a,b],\ f(a)f(b) < 0 \Rightarrow f(c) = 0 \text{ for some } c \in (a,b)$$

Differentiability

$$f'(a) = \lim_{h\to 0} \frac{f(a+h) - f(a)}{h}, \qquad \text{LHD}=\text{RHD}$$

differentiable$\Rightarrow$continuous; not conversely (e.g. $|x|$ at 0)

COMMON CHECKS

$|f(x)|$ may fail where $f(x) = 0$; $\qquad [x]$ discontinuous at integers

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