DERIVAZIONE

Derivata $f'(x) = \lim_{x \to x_0} \dfrac{f(x) - f(x_0)}{x - x_0} = \lim_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$

f derivabile in $x_0 \Rightarrow f$ continua in x_0

OPERAZIONI

Somma	$D\, f+g = f' + g'$	
Prod. scalare	$D\, k f = k f'$	
Prodotto	$D\, fg = f' g + f g'$	
Reciproco	$D\, 1/f = - f' / f^2$	$f \neq 0$
Quoziente	$D\, f/g = (f' g - f g') / g^2$	$g \neq 0$
Potenza	$D\, f^g = f^g (g \log f)' = f^g (g f' / f + g' \log f)$	
Logaritmo	$D \log_g f = (f' \log g / f + g' \log f / g) / \log^2 g$	
Composta	$D\, f \circ g = f' g'$	
Inversa	$D\, f^{-1} = 1 / f'$	

DERIVATE NOTEVOLI

$D\, k = 0$	$D\, a^x = a^x \log a$	$D \sin x = \cos x$
$D\, x^n = a\, x^{n-1}$	$D\, e^x = e^x$	$D \cos x = - \sin x$
$D\, x^a = a\, x^{a-1}$	$D\, x^x = x^x (1 + \log x)$	$D \tan x = 1 + \tan^2 x = 1 / \cos^2 x$
$D\, 1 / x = -1 / x^2$	$D \log_a \lvert x \rvert = 1 / x \log a$	$D \cot x = -1- \cot x = -1 / \sin^2 x$
$D \sqrt{x} = 1 / (2\sqrt{x})$	$D \log \lvert x \rvert = 1 / x$	$D \arcsin x = 1 / \sqrt{1 - x^2}$
		$D \arccos x = -1 / \sqrt{1 - x^2}$
		$D \arctan x = 1 / (1 + x^2)$

TEOREMI *Ipotesi:* f, g continue su $[\, a,b\,]$ e derivabili su $]\, a,b\, [$

1) Rolle $f(a) = f(b) \Rightarrow \exists\, \xi \in\,]\, a,b\, [$ *tale che* $f'(\xi) = 0$

2) Lagrange (valore medio) $\exists\, \xi \in\,]\, a,b\, [$ *tale che* $f'(\xi) = \dfrac{f(b) - f(a)}{b - a}$

3) Cauchy (incrementi finiti) $g(a) \neq g(b) \Rightarrow \exists\, \xi \in\,]\, a,b\, [$ *tale che* $f'(\xi) = g'(\xi)$ *oppure* $\dfrac{f'(\xi)}{g'(\xi)} = \dfrac{f(b) - f(a)}{g(b) - g(a)}$

L'Hôpital *Ipotesi* f, g continue e derivabili in $I(x_0)$

1) *tipo 0/0* f,g non nulle in $I(x_0)$, $f(x_0) = g(x_0) = 0$

2) *tipo ¥/¥* $g' \neq 0$, $\lim f'(x) = \lim g'(x) = \infty$

$\exists \lim_{x \to x_0} f'(x) / g'(x) \Rightarrow \lim_{x \to x_0} f(x) / g(x) = \lim_{x \to x_0} f'(x) / g'(x)$

3) *tipo ¥/¥* si pone: $f - g = \dfrac{1/g - 1/f}{1/fg}$