LIMITI NOTEVOLI

Sia $\boxed{\lim_{x \to x_0} f(x) = 0}$. Allora:

$$\lim_{x \to 0^+} \sin x = 0$$

$$\lim_{x \to x0^+} \cos x = 1$$

$$\lim_{x \to 0} \tan x = 0$$

$$\lim_{x \to x_0} \frac{\sin(f(x))}{f(x)} = 1$$

$$\lim_{x \to x_0} \frac{1 - \cos(f(x))}{(f(x))^2} = \frac{1}{2}$$

$$\lim_{x \to x_0} \frac{\tan f(x)}{f(x)} = 1$$

$$\lim_{x \to x_0} (1 + f(x))^{\frac{1}{f(x)}} = e$$

$$\lim_{x \to -\infty} x \cdot e^x = 0$$

$$\lim_{x \to 0} x \cdot \ln x = 0$$

$$\lim_{x \to x_0} \frac{b^{f(x)} - 1}{f(x)} = \ln b$$

$$\lim_{x \to x_0} \frac{\ln(1 + f(x))}{f(x)} = 1$$

$$\lim_{x \to x_0} \frac{\log_a(1 + f(x))}{f(x)} = \log_a e$$

$$\lim_{x \to x_0} \frac{(1 + f(x))^\alpha - 1}{f(x)} = \alpha$$

$$\lim_{x \to x_0} \frac{f(x) - \sin f(x)}{x^3} = \frac{1}{6}$$

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DERIVATE FONDAMENTALI

$$f(x) = k$$
$$f\,'(x) = 0$$

$$f(x) = x$$
$$f\,'(x) = 1$$

$$f(x) = x^{\alpha}$$
$$f\,'(x) = \alpha x^{\alpha - 1}$$

$$f(x) = e^{x}$$
$$f\,'(x) = e^{x}$$

$$f(x) = \sqrt{x}$$
$$f\,'(x) = -\frac{1}{2\sqrt{x}}$$

$$f(x) = \ln x$$
$$f\,'(x) = \frac{1}{x}$$

$$f(x) = \log_a x$$
$$f\,'(x) = \frac{1}{x} \cdot \log_a e$$

$$f(x) = b^{x}$$
$$f\,'(x) = b^{x} \cdot \ln b$$

$$f(x) = \tan x$$
$$f\,'(x) = 1 + \tan^2 x \vee \frac{1}{\cos^2 x}$$

$$f(x) = \sin x$$
$$f\,'(x) = \cos x$$

$$f(x) = \cos x$$
$$f\,'(x) = -\sin x$$

$$f(x) = \arcsin x$$
$$f\,'(x) = \frac{1}{\sqrt{1 - x^2}}$$

$$f(x) = \arccos x$$
$$f\,'(x) = \frac{1}{\sqrt{1 + x^2}}$$

$$f(x) = \arctan x$$
$$f\,'(x) = \frac{1}{1 + x^2}$$

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INTEGRALI FONDAMENTALI

$$\int 1dx = x + c$$

$$\int x^{\alpha} dx = \frac{x^{\alpha+1}}{\alpha+1}$$

$\alpha \neq -1$

$$\int x^{\alpha} dx = \ln|x| + c$$

$\alpha = -1$

$$\int f'(x) \cdot \sin f(x) dx = -\cos f(x) + c$$

$$\int f(x)' \cdot \cos f(x) dx = \sin f(x) + c$$

$$\int \frac{f(x)'}{\cos^2 f(x)} dx = \tan f(x) + c$$

$$\int \frac{f(x)'}{1 + f^2(x)} dx = \arctan x + c$$

$$\int \frac{f(x)'}{\sqrt{1 + f^2(x)}} dx = \arccos x + c$$

$$\int \frac{f(x)'}{\sqrt{1 - f^2(x)}} dx = \arcsin x + c$$

$$\int f(x)' \cdot b^{f(x)} dx = \frac{b^{f(x)}}{\ln b} + c$$

$$\int f(x)' \cdot e^{f(x)} dx = e^{f(x)} + c$$

$$\boxed{\int f'(x) \cdot f(x) dx = \frac{f^{\alpha+1}(x)}{\alpha+1} + c}$$

$$\boxed{\int \frac{f'(x)}{f(x)} dx = \ln|f(x)| + c}$$

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REGOLE DI DERIVAZIONE

- **SOMMA**

$$(f+g)'(x_0) = f'(x_0) + g'(x_0)$$

- **PRODOTTO**

$$(f \cdot g)'(x_0) = f'(x_0) \cdot g(x_0) + g'(x_0) \cdot f(x_0)$$

- **RECIPROCO**

$$\left(\frac{1}{f}\right)'(x_0) = \frac{f'(x_0)}{f^2(x_0)}$$

- **QUOZIENTE**

$$\left(\frac{f}{g}\right)'(x_0) = \frac{f'(x_0) \cdot g(x_0) - g'(x_0) \cdot f(x_0)}{g^2(x_0)}$$

- **INVERSA**

$$(f^{-1})(y_0) = \frac{1}{f'(x_0)}$$

- **COMPOSIZIONE**

$$(g \circ f)'(x_0) = g'(f(x_0)) \cdot f'(x_0)$$

REGOLE DI INTEGRAZIONE

- **PER PARTI**

$$\int f(x) \cdot g(x) dx = F(x) \cdot g(x) - \int F(x) \cdot g'(x) dx$$

- **PER SOSTITUZIONE (SOSTITUZIONI PIU' COMUNI)**

$$t = \ln f(x)$$

$$t = \sqrt{f(x)}$$

RICORDA:

$$dx = f'(t) \cdot dt$$