

# Formulario

Nicola Ferru

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## 1 Derivate

- $D(x^n) = n * x^{n-1}$
- $D(\log_a x) = \frac{1}{x} \log_a e$
- $D(a^x) = a^x \ln a$
- $D(\sin x) = \cos x$
- $D(\cos x) = -\sin x$
- $D(k) = 0$
- $D(\ln x) = \frac{1}{x}$
- $D(e^x) = e^x$
- $D(\tan x) = \frac{1}{\cos^2 x} = 1 + \tan^2 x$
- $D(\arcsin x) = \frac{1}{\sqrt{1-x^2}}$
- $D(\arccos x) = -\frac{1}{\sqrt{1-x^2}}$
- $D(\arctan x) = \frac{1}{1+x^2}$

Casi:

$$D[k * f(x)] = k * f'(x) \quad (1)$$

$$D \left[ \frac{f(x)}{g(x)} \right] = \frac{f' * g - f * g'}{[g]^2} \quad (3)$$

$$D[f(x) + g(x) + h(x)] = f' + g' + h' \quad (2)$$

$$D \left[ \frac{1}{f(x)} \right] = \frac{f'(x)}{[f(x)]^2} \quad (4)$$

$$D[f(g(x))] = f'[g(x)] * g' \quad (5)$$

### 1.1 Limiti Notevoli

#### 1.1.1 esponenziali e logaritmici

$$\lim_{x \rightarrow \pm\infty} \left(1 + \frac{1}{x}\right)^x = e \quad (6)$$

$$\lim_{x \rightarrow -\infty} \left(1 + \frac{a}{x}\right)^x = \frac{1}{e} \quad (9)$$

$$\lim_{x \rightarrow +\infty} \left(1 + \frac{a}{x}\right)^x = e^a \quad (7)$$

$$\lim_{x \rightarrow 0} (1 + ax)^{\frac{1}{x}} = e^a \quad (10)$$

$$\lim_{x \rightarrow +\infty} \left(1 + \frac{a}{x}\right)^{nx} = e^{na} \quad (8)$$

$$\lim_{x \rightarrow 0} \lg_a (1 + x)^{\frac{1}{x}} = \frac{1}{\lg_e a} \quad (11)$$

$$\lim_{x \rightarrow 0} \frac{\lg_a(1+x)}{x} = \lg_a e = \frac{1}{\ln a} \quad (12)$$

$$\lim_{x \rightarrow +\infty} x^r a^x = \lim_{x \rightarrow +\infty} a^x \quad (18)$$

$$\lim_{x \rightarrow 0} \frac{a^x - 1}{x} = \ln a \quad (13)$$

$$\lim_{x \rightarrow -\infty} |x|^r a^x = \lim_{x \rightarrow \infty} a^x \quad (19)$$

$$\lim_{x \rightarrow 0} \frac{(1+x)^a - 1}{x} = a \quad (14)$$

$$\lim_{x \rightarrow +\infty} \frac{e^x}{x^r} = \lim_{x \rightarrow +\infty} a^x \quad \forall r \in R^+ \quad (20)$$

$$\lim_{x \rightarrow 0} \frac{(1+x)^a - 1}{x} = 1 \quad (15)$$

$$\lim_{x \rightarrow +\infty} \frac{x^x}{e^r} = \lim_{x \rightarrow +\infty} a^x \quad \forall r \in R^+ \quad (21)$$

$$\lim_{x \rightarrow 0} x^r \lg_a x = 0 \quad \forall r \in R^+ - \{1\}, \quad \forall r \in R^+ \quad (16)$$

$$\lim_{x \rightarrow -\infty} e^x * x^r = 0 \quad \forall r \in R^+ \quad (22)$$

$$\lim_{x \rightarrow 0} \frac{\lg_a x}{x^r} = 0 \quad \forall r \in R^+ - \{1\}, \quad \forall r \in R^+ \quad (17)$$

## 1.2 Goniometrici

$$\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1 \quad (23)$$

$$\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2} = \frac{1}{2} \quad (27)$$

$$\lim_{x \rightarrow 0} \frac{\sin ax}{bx} = \frac{a}{b} \quad (24)$$

$$\lim_{x \rightarrow 0} \frac{\arcsin ax}{bx} = \frac{a}{b} \quad (28)$$

$$\lim_{x \rightarrow 0} \frac{\tan x}{x} = 1 \quad (25)$$

$$\lim_{x \rightarrow 0} \frac{\arctan x}{x} = 1 \quad (29)$$

$$\lim_{x \rightarrow 0} \frac{1 - \cos x}{x} = 0 \quad (26)$$

## 2 formula retta tangente

$$(y - y_0) = m(x - x_0) \quad (30)$$

$$m = f'(x_0) \quad (31)$$