$$y_0(x)\begin{cases} \Delta>0 & c_1 e^{\lambda_1 x}+c_2 e^{\lambda_2 x}\\ \Delta=0 & c_1 e^{\lambda x}+c_2 x e^{\lambda x}\\ \Delta<0 & e^{\alpha x}[c_1\cos(\beta x)+c_2\sin(\beta x)]\end{cases}$$

Integrazione

$PT(P)=f(P)+f'_x(P)(x-x_0)+f'_y(P)(y-y_0)$

$\int f\cdot g = f\cdot[\int g]-\int f'\cdot[\int g]$

$\int_a^{\pm\infty} f(x) = \lim_{t\to\pm\infty}\int_a^t f(x)\,dt$

$\int_\gamma w = U(t_1)-U(t_0)$ Finale - iniziale

$\int \frac{1}{x^2+a^2}\,dx = \frac{1}{a}\operatorname{atan}\left(\frac{x}{a}\right)$

$\int \frac{1}{\sqrt{a^2-x^2}} = \operatorname{asin}\left(\frac{x}{a}\right)$

$\int a^x = \frac{a^x}{\ln a}$

$\frac{x-x_0}{x_1-x_0} = \frac{y-y_0}{y_1-y_0}$

Serie

$2\sin(x)\cos(x) = \sin(2x)$

$\sum_{n=0}^{\infty} q^n \Rightarrow S_n = \frac{1-q^n}{1-q}$
$-1<q<1 \to$ Conv
$q\geq 1 \to$ Div $q<-1 \to$ oscilla

$\lim_{n\to\infty}\sqrt[n]{a_n} = \ell$

$\sum_{n=1}^{\infty}\frac{1}{n^k}$ $k>1$ conv $k<1$ Div

$(n+1)! = (n+1)n!$

$(n+1)^{n+1} = (n+1)\cdot(n+1)^n$

RAABE
$\lim_{n\to\infty} n\cdot\left[\frac{a_n}{a_{n-1}}-1\right] = \ell$
$\ell>1$ conv $\ell<1$ div

Rapporto
$\lim_{n\to\infty}\frac{a_{n+1}}{a_n} = \ell$
$\ell>1 \to$ Div $\ell<1 \to$ Conv

Leibniz
$\sum_{n=0}^{\infty}(-1)^n$ conv $\Leftrightarrow$ 1) C.N.
2) a_n Decrescente
$a_n = \frac{1}{n} \Rightarrow \frac{1}{n+1} < \frac{1}{n}$ ↑

Se $\lim_{n\to\infty}\frac{a_n}{b_n} = \ell \neq 0$
- $\ell=0$, b_n conv. $\to a_n$ conv
- $\ell=\infty$, b_n Div. $\to a_n$ Div

usiamo $b_n = \frac{1}{n^\alpha}$ $\alpha>1$ conv $\alpha\leq 1$ Div+

Derivate importanti

$a^x = a^x\ln(a)$ $\tan(x) = \frac{1}{\cos^2(x)}$
$\operatorname{asin}(x) = \frac{1}{\sqrt{1-x^2}}$ $\operatorname{acos}(x) = -\frac{1}{\sqrt{1-x^2}}$
$\operatorname{atan}(x) = \frac{1}{1+x^2}$

$H(P)>0$ $f_{xx}(P)>0$ min

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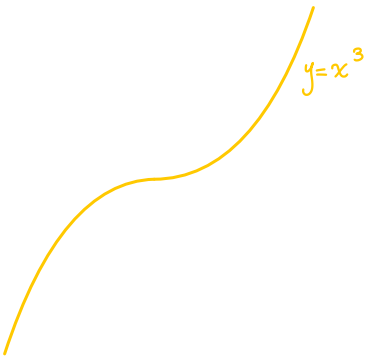
$H(P)>0$ $f_{xx}(P)>0$ min

$\lim_{x\to 0}\frac{\sin x}{x} = 1$ $\lim_{x\to\infty}\left(1+\frac{a}{x}\right)^x = e^a$

$\lim_{x\to 0}\frac{a^x-1}{x} = \log(a)$ con $a=e \to 1$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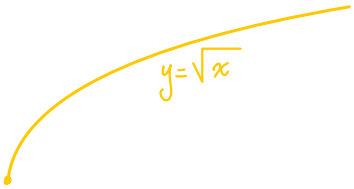
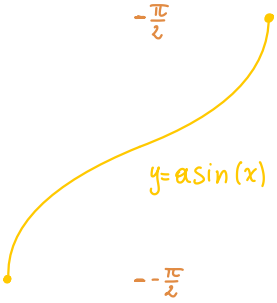
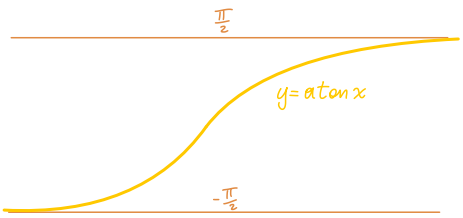

$y=\sqrt{x}$


$-\frac{\pi}{2}$
$y=a\sin(x)$
$--\frac{\pi}{2}$


$\frac{\pi}{2}$
$y=a\tan x$
$-\frac{\pi}{2}$