1) Determinare il carattere di $\sum_{n=1}^{+\infty}\underbrace{\left(\arctan\frac{1}{n}-\frac{1}{n}\right)}$

$\sum_{n=1}^{+\infty}\arctan\frac{1}{n}\to+\infty$ , $\sum_{n=1}^{+\infty}-\frac{1}{n}\to-\infty$ ↳ Serie somma: converge quando $a_n\to l$ e $b_n\to m$. Non possiamo dire nulla se $a_n\to-\infty$ $b_n\to+\infty$.

$T_3^0(\arctan t)=t-\frac{t^3}{3}+o(t^3)\Rightarrow T_3^0(\arctan\frac{1}{x})=\frac{1}{n}-\frac{1}{3}\left(\frac{1}{n}\right)^3+o\left(\frac{1}{n^3}\right)\to\sum_{n=0}^{+\infty}\arctan\frac{1}{n}-\frac{1}{n}=\sum_{n=0}^{+\infty}\cancel{\frac{1}{n}}-\frac{1}{3}\left(\frac{1}{n}\right)^3\cancel{-\frac{1}{n}}=-\frac{1}{3}\sum_{n=1}^{+\infty}\frac{1}{n^3}\Rightarrow$ converge.

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2) $\int(3x-1)^7dx=\frac{1}{3}\int3(3x-1)^7dx=\frac{(3x-1)^8}{24}+c$

$\int x\sqrt{9-4x^2}\,dx=-\frac{1}{8}\int-8x\sqrt{9-4x^2}\,dx=\frac{2(9-4x^2)^{3/2}}{3}\cdot\left(-\frac{1}{\cancel{8}_4}\right)+c=-\frac{(9-4x^2)^{3/2}}{12}+c$

$\int\frac{\ln^2x}{x}dx=\frac{\log^3x}{3}+c$

$\int\frac{1}{x\log x}dx=\ln|\ln x|+c$

$\int\tan(x)\,dx=\int\frac{\sin x}{\cos x}dx=-\int-\frac{\sin x}{\cos x}dx=-\ln|\cos x|+c$

$\int3x^3e^{4x^4}dx=\frac{3}{16}\int16x^3e^{4x^4}dx=\frac{3}{16}e^{4x^4}+c$

$\int\frac{\sin\sqrt{x}}{\sqrt{x}}dx=2\int\frac{\sin\sqrt{x}}{2\sqrt{x}}dx=-2\cos\sqrt{x}+c$

$\int xe^xdx=xe^x-\int e^xdx=xe^x-e^x+c$

$f\ x$ $\quad f'\ 1$

$g'\ e^x$ $\quad g\ e^x$

$\int2x(\ln x)^2=(\ln x)^2\cdot x^2-\int\frac{2\ln x}{\cancel{x}}\cdot\cancel{x^2}dx=(x\ln x)^2-\int x\ln x\,dx=(x\ln x)^2-\left[\frac{x^2\ln x}{2}-\int\frac{1}{\cancel{x}}\frac{x^{\cancel{2}}}{2}dx\right]=(x\ln x)^2-\left[\frac{x^2\ln x}{2}-\frac{1}{2}\frac{x^2}{2}\right]+c$

$g'$ $f$ $(\ln x)^2$ $\quad f'\ \frac{2\ln x}{x}$ $\qquad\qquad f\ \ln x$ $\quad f'\ \frac{1}{x}$

$g'=2x$ $\quad g=x^2$ $\qquad\qquad g'\ x$ $\quad g\ \frac{x^2}{2}$