$$\lim_{x\to 0} \frac{\arcsin x - x}{tg\, x^2(1-\cos 2x) - \sin(\log(1+3x^3))} =$$

$$= \lim_{x\to 0} \frac{\arcsin x - x}{\frac{tg\, x^2(1-\cos 2x)}{x^2 \cdot 4x^2}\cdot 4x^4 - \frac{\sin(\log(1+3x^3))}{\log(1+3x^3)}\,\frac{\log(1+3x^3)}{3x^3}\cdot 3x^3} =$$

$$= \lim_{x\to 0} \frac{\arcsin x - x}{\left[\underbrace{\frac{tg\, x^2}{x^2}\cdot\frac{1-\cos 2x}{4x^2}\cdot 4}_{1\cdot\frac{1}{2}\cdot 4}\underbrace{x}_{0} - \underbrace{\frac{\sin(\log(1+3x^3))}{\log(1+3x^3)}}_{1}\cdot\underbrace{\frac{\log(1+3x^3)}{3x^3}}_{1}\cdot\underbrace{3}_{3}\right]x^3} \quad (*)$$

svolgo a parte il $\lim_{x\to 0} \frac{\arcsin x - x}{x^3} \overset{H}{=} \lim_{x\to 0} \frac{\frac{1}{\sqrt{1-x^2}} - 1}{3x^2} =$

$$= \lim_{x\to 0} \frac{1-\sqrt{1-x^2}}{3x^2\sqrt{1-x^2}} = \left\{\begin{array}{l}\text{divido e moltiplico}\\ \text{per } 1+\sqrt{1-x^2}\end{array}\right\} =$$

$$= \lim_{x\to 0} \frac{(1-\sqrt{1-x^2})(1+\sqrt{1-x^2})}{3x^2\sqrt{1-x^2}\,(1+\sqrt{1-x^2})} = \lim_{x\to 0} \frac{1-(1-x^2)}{3x^2\underbrace{\sqrt{1-x^2}}_{1}\,(\underbrace{1+\sqrt{1-x^2}}_{2})} =$$

$= \lim_{x\to 0} \frac{\cancel{x^2}}{3\cancel{x^2}\cdot 2} = \frac{1}{6}$ – Dunque passando al limite in (*) si ha:

$$\frac{\frac{1}{6}}{0-3} = -\frac{1}{18}$$

- $$\int x^2 \log x \, dx = \frac{x^3}{3} \log x - \int \frac{x^3}{3} \cdot \frac{1}{x} \, dx = \frac{x^3}{3} \log x - \frac{1}{3} \int x^2 \, dx =$$

$$= x^3 \log x - \frac{x^3}{9} + c$$

- $$\int x^2 \cos x \, dx = x^2 \sin x - \int 2x \sin x \, dx = x^2 \sin x - 2\left(-x \cos x + \int \cos x \, dx \right) = x^2 \sin x + 2x \cos x - 2 \sin x + c$$

PER ITERAZIONE

- $$\int \sin(\log x) \, dx = x \sin(\log x) - \int \frac{x \cos(\log x)}{x} \, dx = x \sin(\log x) - \left(x \cos(\log x) + \int x \sin(\log x) \, dx \right) =$$

$$= x \left[\sin(\log x) - \cos(\log x) \right] - \int x \sin(\log x) \, dx$$

$$\iff 2 \int \sin(\log x) \, dx = x \left[\sin(\log x) - \cos(\log x) \right] + c$$

$$\iff \int \sin(\log x) \, dx = \frac{x}{2} \left[\sin(\log x) - \cos(\log x) \right] + c$$

- $$\int x^2 e^{-x} \, dx = -x^2 e^{-x} + 2 \int x e^{-x} \, dx = -x^2 e^{-x} + 2\left(-x e^{-x} + \int e^{-x} \, dx \right) =$$

$$= -x^2 e^{-x} - 2x e^{-x} - 2e^{-x} \cancel{dx} + c =$$

$$= -e^{-x} (x^2 + 2x + 2) + c$$