CON DE L' HÔPITAL

$$L = \lim_{x\to 0} \frac{240x - 240\sin x - 40x^3 + x^5}{x^5} =$$

$$= \lim_{x\to 0} \frac{240 - 240\cos x - 120x^2 + 5x^4}{5x^4} =$$

$$= \lim_{x\to 0} \frac{240\sin x - 240x + 20x^3}{20x^3} =$$

$$= \lim_{x\to 0} \frac{240\cos x - 240 + 60x^2}{60x^2} =$$

$$= \lim_{x\to 0} \frac{-240\sin x + 120x}{120x} =$$

$$= \lim_{x\to 0} \frac{-240\overset{1}{\cos x} + 120}{120} = \frac{-240+120}{120} = -\frac{120}{120} = -1$$

CALCOLIAMO L' INTEGRALE

$$J_2 = \int_0^{\pi/2} \sin\vartheta \cos\vartheta \, d\vartheta = \int_0^{\pi/2} \sin\vartheta \, D(\sin\vartheta) \, d\vartheta$$

Consideriamo l'integrale indefinito associato:

$$\int \sin\vartheta \, D(\sin\vartheta) \, d\vartheta \overset{\sin\vartheta = w}{=\!=} \int w \cdot w'(\vartheta) \, d\vartheta =$$

$$= \int w \cdot \frac{dw}{d\vartheta} \, d\vartheta = \int w \, dw =: \frac{w^2}{2} + c \overset{w = \sin\vartheta}{=\!=}$$

$$\overset{w = \sin\vartheta}{=\!=} \frac{(\sin\vartheta)^2}{2} + c \text{, quindi}$$

$$J_2 = \left[\frac{(\sin\vartheta)^2}{2} \right]_0^{\pi/2} = \frac{\left(\sin\frac{\pi}{2}\right)^2}{2} - \frac{(\sin 0)^2}{2} =$$

$$= \frac{1}{2} - 0 = \frac{1}{2}$$