$\boxed{\text{ESERCIZIO 2}}$ Calcolare

$$I = \int_1^{e^{\sqrt{6}\pi}} x^{\sqrt{2}-1} \operatorname{sen}(\sqrt{6}\ln x)\,dx$$

Integrando per sostituzione con $x = e^t$ si ha

$$I = \int_0^{\sqrt{6}\pi} e^{\sqrt{2}t} \operatorname{sen}(\sqrt{6}t)\,dt$$

Integrando per parti due volte si ottiene il risultato, infatti:

$$I = \cancel{\left[\frac{e^{\sqrt{2}t}}{\sqrt{2}} \operatorname{sen}(\sqrt{6}t)\right]_0^{\sqrt{6}\pi}}^{\,0} - \int_0^{\sqrt{6}\pi} \frac{e^{\sqrt{2}t}}{\sqrt{2}} \cdot \sqrt{6}\cos(\sqrt{6}t)\,dt$$

$$= -\left(\left[\frac{\sqrt{6}}{2} e^{\sqrt{2}t} \cos(\sqrt{6}t)\right]_0^{\sqrt{6}\pi} + \underbrace{\int_0^{\sqrt{6}\pi} \frac{\sqrt{6}}{2} e^{\sqrt{2}t} \cdot \sqrt{6} \operatorname{sen}(\sqrt{6}t)\,dt}_{=3I} \right)$$

$$\Rightarrow +4I = -\frac{\sqrt{6}}{2}\left(e^{\sqrt{12}\pi} \cancel{\cos(6\pi)}^{\,1} - 1 \right)$$

$$\Rightarrow I = -\frac{\sqrt{6}}{8}\left(e^{2\pi\sqrt{3}} - 1 \right)$$