Multiple Integration
Iteration of Double Integrals

Question
Find the volume of the given solid
Below $z = x^2 \sin(y^4)$ and over the triangle in the xy-plane defined by the vertices $(0,0)$, $(0,\pi^{1/4})$ and $(\pi^{1/4},\pi^{1/4})$.
Answer

$$\begin{aligned} V &= \int_0^{\pi^{1/4}} dy \int_0^y x^2 \sin(y^4)\, dx \\ &= \frac{1}{3}\int_0^{\pi^{1/4}} y^3 \sin(y^4)\, dy \\ \text{Let } u &= y^4 \\ du &= 4y^3 dy \\ \\ \Rightarrow V &= \frac{1}{12}\int_0^{\pi} \sin u\, du \\ &= \frac{1}{6}\text{cu. units} \end{aligned}$$