

1. $\int_0^{\pi/3} \int_0^{\sec \theta} r^3 dr d\theta$

Inner: $\frac{\sec^4 \theta}{4}$

outer $\frac{1}{4} \left(\tan \theta + \frac{\tan^3 \theta}{3} \right) \bigg|_0^{\pi/3} = \frac{\sqrt{3}}{2}$