2. (10 pts) Setup the integral to determine the volume of the solid enclosed by the paraboloids $z = x^2 + y^2 - 4$ and $z = 46 - x^2 - y^2$. Use cartesion coordinates. (**Do not evaluate.**)

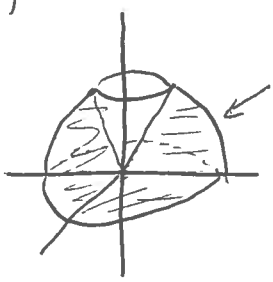
Volume Integral: _____

Correct Solution.

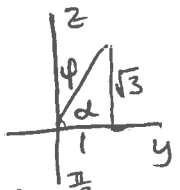
3. (10 pts) Set up a triple integral in spherical coordinates to find the volume of the solid inside the surface $x^2 + y^2 + z^2 = 25$, outside the surface $z = \sqrt{3(x^2 + y^2)}$ and above the xy-plane.

↑ Sphere

↑ Cone



Find this volume.



$x=0$

$z = \sqrt{3y^2} = \sqrt{3}\,y$

if $y=1$, $z=\sqrt{3}$

$\varphi = \frac{\pi}{2} - \alpha \rightarrow \varphi = \frac{\pi}{2} - \frac{\pi}{3} = \frac{\pi}{6}$

$\alpha = \tan^{-1}\left(\frac{\sqrt{3}}{1}\right) = \tan^{-1}\left(\frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}}\right) = \frac{\pi}{3}$

$0 \le \varphi \le \frac{\pi}{6}$

$0 \le \rho \le 5$

$0 \le \theta \le 2\pi$

Volume Integral: _____ $\int_0^{\frac{\pi}{6}} \int_0^{2\pi} \int_0^5 \rho^2 \sin\varphi \, d\rho \, d\theta \, d\varphi$

alternative order Ans, if it matches integrals