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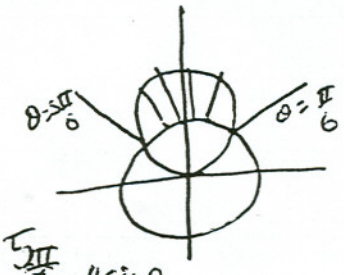
3. Find the volume of the solid which is bounded by $z = 9 - x^2 - y^2$ and $z = 0$.

Circle of radius 3

$$\int_0^{2\pi}\int_0^{3}\int_0^{9-r^2} r\,dz\,dr\,d\theta = 2\pi\int_0^3 r9 - r^3\,dr = \frac{9r^2}{2} - \frac{r^4}{4}\Big]_0^3 2\pi$$

$$= \left(\frac{81}{2} - \frac{81}{4}\right)2\pi = \left(\frac{81}{4}\right)2\pi = \frac{81\pi}{2}$$

4. Find the area inside $r = 4\sin\theta$ and outside $r = 2$.



intersection $2 = 4\sin\theta$

$\frac{1}{2} = \sin\theta$

$\frac{\pi}{6}, \frac{5\pi}{6} = \theta$

$$\int_{\frac{\pi}{6}}^{\frac{5\pi}{6}}\int_2^{4\sin\theta} r\,dr\,d\theta = \int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} \frac{r^2}{2}\Big]_2^{4\sin\theta} d\theta = \int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} \frac{16\sin^2\theta}{2} - \frac{4}{2}\,d\theta$$

$$= \int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} 8\,\frac{1-\cos 2\theta}{2} - 2\,d\theta = 2\theta - 2\sin 2\theta\Big]_{\frac{\pi}{6}}^{\frac{5\pi}{6}}$$

$$= \frac{10\pi}{6} + 2\frac{\sqrt{3}}{2} - \left(\frac{2\pi}{6} + 2\frac{\sqrt{3}}{2}\right) = \frac{4\pi}{3} + 4\frac{\sqrt{3}}{2}$$