Q1: Find the area inside the polar curve $r = 2\sin\theta$ and outside the curve $r = 1$.
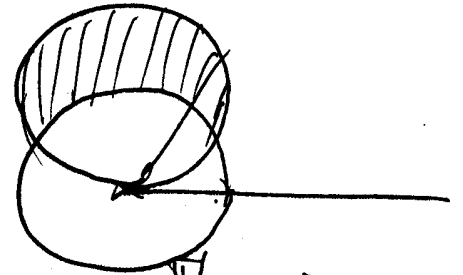
$2\sin\theta = 1 \Rightarrow \sin\theta = \frac{1}{2} \Rightarrow \theta = \frac{\pi}{6}, \frac{5\pi}{6}$

$A = \frac{1}{2}\int_{\pi/6}^{5\pi/6}\left[4\sin^2\theta - 1\right]d\theta$

$= \frac{1}{2}\int_{\pi/6}^{\pi/2}\left[2 - 2\cos2\theta - 1\right]d\theta$

$= \int_{\pi/6}^{\pi/2}\left(1 - 2\cos2\theta\right)d\theta = \theta - \sin2\theta\Big]_{\pi/6}^{\pi/2} = \frac{\pi}{3} - 0 + \frac{\sqrt{3}}{2}$

Q2: Find equation of the sphere that is centered at $(2,1,0)$, and tangent to the $z-axis$.

tangent to $z-axis \Rightarrow r = \sqrt{4+1} = \sqrt{5}$

$(x-2)^2 + (y-1)^2 + z^2 = 5$

Q3: Find the magnitude of $\mathbf{u}+\mathbf{v}$ and $\mathbf{u}-\mathbf{v}$, where $\mathbf{u} = \langle 1,2,-1\rangle$ and $\mathbf{v} = \langle -2,1,0\rangle$.

$\vec{u}+\vec{v} = \langle -1, 3, -1\rangle, \qquad \vec{u}-\vec{v} = \langle 3, 1, -$

$\|\vec{u}+\vec{v}\| = \sqrt{1+9+1} = \sqrt{11}$

$\|\vec{u}-\vec{v}\| = \sqrt{9+1+1} = \sqrt{11}$