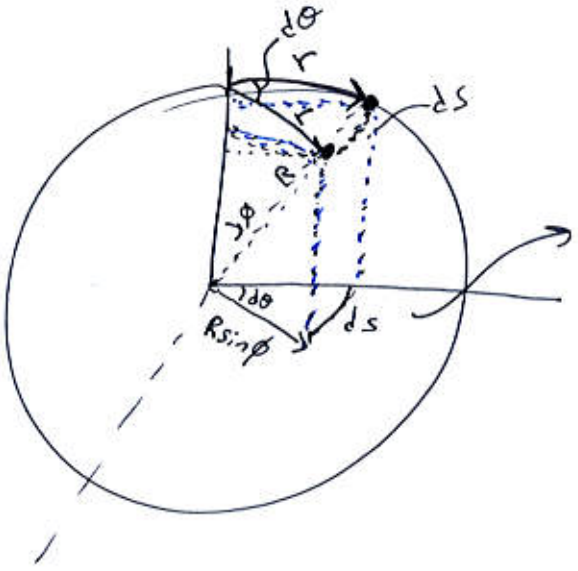
2) - Alternate Solution

a)



$R\phi = r \rightarrow \phi = r/R$

$ds = R\sin\phi\, d\theta$

$$\rightarrow \boxed{d\theta = \frac{ds}{R\sin(r/R)}}$$

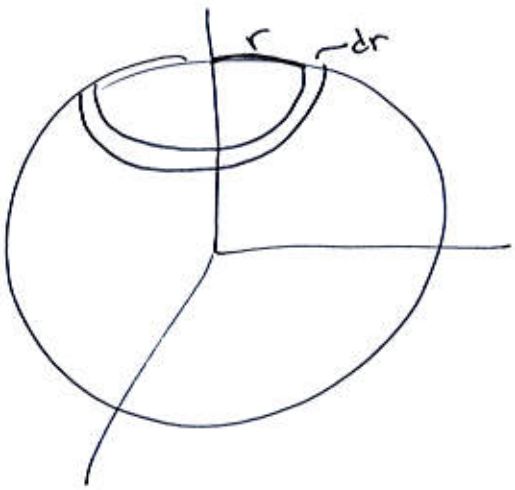
b) C is ds as $d\theta \rightarrow 2\pi$:

$ds = R\sin(r/R)\, d\theta$

$$\rightarrow \boxed{C = 2\pi R \sin(r/R)}$$

c) $N = nA(r)$ → A = surface area of sphere

integrate rings of area = C×dr:



$dA = 2\pi R\sin(r/R)\, dr$

$A = 2\pi R^2 \int_0^r \sin(r/R)\, d\sim$

$= 2\pi R^2 \left(+\cos(r/R)\Big|_r^0\right) \times R$

$= 2\pi R^2 \left(\cos(0) - \cos(r/R)\right)$

$= 2\pi R^2 \left(1 - \cos(r/R)\right)$

$$\rightarrow \boxed{N = 2\pi n R^2 \left(1 - \cos(r/R)\right)}$$