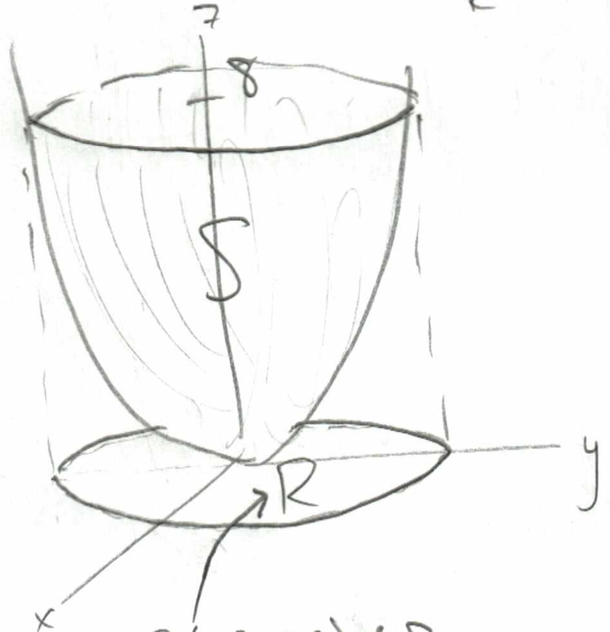
$\boxed{\S 14.6 \# 32}$ $z = 2(x^2+y^2)$; $0 \le z \le 8$

$$\text{area} = \iint_S dS = \iint_R |\vec{r}_x \times \vec{r}_y| \, dx\,dy$$



$2(x^2+y^2) \le 8$

$\Rightarrow x^2+y^2 \le 4$

$\vec{r}(x,y) = \langle x, y, 2(x^2+y^2) \rangle$

$\vec{r}_x = \langle 1, 0, 4x \rangle$

$\vec{r}_y = \langle 0, 1, 4y \rangle$

$\Rightarrow \vec{r}_x \times \vec{r}_y = \langle -4x, -4y, 1 \rangle$

$|\vec{r}_x \times \vec{r}_y| = \sqrt{(-4x)^2 + (-4y)^2 + 1^2}$

$16x^2 + 16y^2 + 1$

$\iint_R \sqrt{16x^2+16y^2+1} \, dx\,dy \leftarrow$ use polar coords

$$= \int_0^{2\pi} \int_0^2 r\sqrt{16r^2+1} \, dr\,d\theta$$

Put $u = 16r^2+1$

$du = 32r\,dr$

$\Rightarrow \frac{1}{32} du = r\,dr$

$\longrightarrow$

$u(0) = 16(0)^2 + 1 = 1$

$u(2) = 16(2)^2 + 1 = 65$

$$= \frac{1}{32} \int_0^{2\pi} \int_1^{65} u^{1/2} \, du \, d\theta$$

$$= \frac{1}{\cancel{32}_{16}} \left(\frac{\cancel{2}}{3}\right) \int_0^{2\pi} \left(65^{3/2} - 1^{3/2}\right) d\theta$$

$$= \frac{1}{\cancel{48}_{24}} \left(65\sqrt{65} - 1\right)\left(\cancel{2}\pi\right) = \boxed{\frac{\left(65\sqrt{65} - 1\right)\pi}{24}}$$