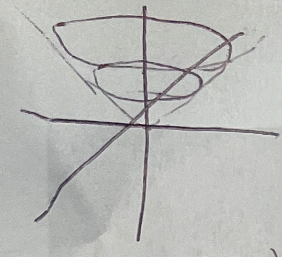
1. 

$\boxed{\vec{S}(u,v) = \langle u, v, \sqrt{u^2+v^2}\rangle}$

$-\infty \le u \le \infty$
$-\infty \le v \le \infty$

~~Second method: unknown~~

$\vec{S}(r,\theta) = \langle r\cos\theta, r\sin\theta, r\rangle$

$0 \le r \le \infty$ | $0 \le \theta \le 2\pi$

2. $\vec{r}(s,t) =$ $\langle \cos(s), t, t\cdot\sin(s)\rangle$

$f(x,y,z) = z^2 + x^2y^2$

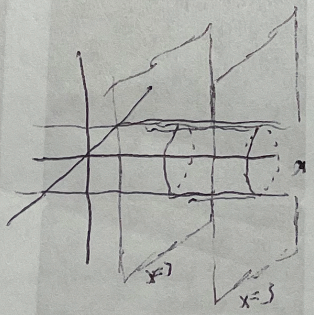
$0 \le s \le 2\pi$
$0 \le t \le 5$

$$\iint_R f(x,y,z) = \iint_A \overbrace{t^2\sin^2 s + t^2\cos^2 s}^{t^2}\, dA = \boxed{\int_0^5\int_0^{2\pi} t^2\, ds\,dt} = \int_0^5 2\pi t^2\,dt = \frac{2\pi t^3}{3}\Big|_0^5$$

$$\boxed{\frac{250\pi}{3}}$$

3. $y^2+z^2=4$

$+1 \le x \le 5$



$\iint_R (xy^2+xz^2)\,ds$

$S(\theta, x) = \langle x, 2\cos\theta, 2\sin\theta\rangle$

$1 \le x \le 5$
$0 \le \theta \le 2\pi$

$$\int_0^{2\pi}\int_1^5 x\cos^2\theta + x\sin^2\theta\, dx\,d\theta = \int_0^{2\pi}\int_1^5 x\,dx\,d\theta = \int_0^{2\pi} \frac{x^2}{2}\Big|_1^5 d\theta = \int_0^{2\pi} \frac{25}{2} - \frac{1}{2}\,d\theta = \int_0^{2\pi} 12\,d\theta = 24\pi$$