Surface Integrals of Scalar Functions- HW Problems

Evlauate the following surface integrals.

1. $\iint_S (z+3)dS$; where S is given by $\vec{\Phi}(u,v) = < u, \frac{v}{2}, \frac{v}{4} >$; $(u,v) \in [0,3] \times [0,4]$.

2. $\iint_S (x^2)dS$; where S is portion of the cylinder in $\mathbb{R}^3$ given by $x^2 + y^2 = 9, \ 1 \leq z \leq 3$.

3. $\iint_S (xz - yz)dS$; where S is portion of the plane in $\mathbb{R}^3$ $z = x + y + 2$, that lies inside the cylinder $x^2 + y^2 = 1$.

4. $\iint_S (z)dS$; where S is the interior of the triangle with vertices at $(2,0,0), \ (0,1,0),$ and $(1,0,1)$.

5. $\iint_S \left(\frac{2xy}{z}\right) dS$; where S is given in $\mathbb{R}^3$ by $z = x^2 + y^2$ where $4 \leq x^2 + y^2 \leq 9, \ x \geq 0, \ y \geq 0$.

6. $\iint_S \left(\sqrt{x^2 + y^2 + z^2}\right)dS$; where S is given in $\mathbb{R}^3$ by $z = \sqrt{x^2 + y^2}$ where $x^2 + y^2 \leq 1$.

7. $\iint_S (z+1)dS$; where S is given in $\mathbb{R}^3$ by $z = 4 - x^2 - y^2$ where $x^2 + y^2 \leq 4$.

8. $\iint_S (z^2)dS$; where S is the upper unit hemisphere.

9. A helicoid, S, is parametrized by

$\vec{\Phi}(r,\theta) = < rcos(\theta), rsin(\theta), \theta >$; where $0 \leq r \leq 4,\ 0 \leq \theta \leq 2\pi$. Suppose the density at $(x,y,z) \in S$ is given by $\rho(x,y,z) = (x^2+y^2)^{\frac{3}{2}} = (r^2)^{\frac{3}{2}}$. Find the mass of the helicoid.