

1. (5 points) Use Stokes' Theorem to calculate the flux of the curl of the field \vec{F} across the surface S in the direction of the outward unit normal \vec{n} .

$$\vec{F} = (y - z)\vec{i} + (z - x)\vec{j} + (x + z)\vec{k}$$

$$S := \vec{r}(r, \theta) = (r \cos \theta)\vec{i} + (r \sin \theta)\vec{j} + (9 - r^2)\vec{k}$$

$$0 \leq r \leq 3, \quad 0 \leq \theta \leq 2\pi$$

2. (5 points) Use the Divergence Theorem to find the outward flux of \vec{F} across the boundary of the region D .

$$\vec{F} = 2xz\vec{i} - xy\vec{j} - z^2\vec{k}$$

D : The wedge cut from the first octant by the plane $y + z = 4$

and the elliptical cylinder $4x^2 + y^2 = 16$