Worksheet 18 - Stokes' Theorem

1. Find the circulation of the field:

$$\vec{F} = \left\langle y, xz, x^2 \right\rangle$$

around the curve C, where C is the boundary of the triangle cut from $4x + y + z = 4$ by the first octant, counterclockwise when viewed from above.

2. Evaluate:

$$\iint_S \nabla \times (3y\vec{i}) \cdot \vec{n} \, d\sigma,$$

where S is the hemisphere $x^2 + y^2 + z^2 = 1$, $z \geq 0$.

3. Compute the flux of the curl of the field:

$$\vec{F} = \left\langle 4y, 5 - 5x, z^2 - 2 \right\rangle$$

across the surface S:

$$S \ : \ \vec{r}(\phi, \theta) = \left\langle \sqrt{5} \sin \phi \cos \theta, \ \sqrt{5} \sin \phi \sin \theta, \ \sqrt{5} \cos \phi \right\rangle, \ 0 \leq \phi \leq \frac{\pi}{2}, \ 0 \leq \theta \leq 2\pi,$$

in the direction of the outward unit normal.