Name:

Stokes's Theorem: If C is the boundary of a 'nice' region $\mathcal{S}$,

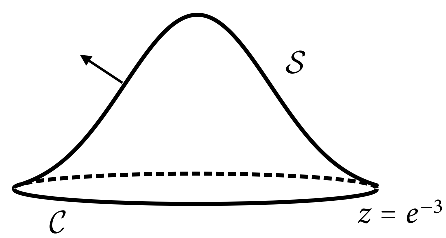
$$\iint_S (\nabla \times \mathbf{F}) \cdot \mathbf{n}\, dS = \int_C \mathbf{F} \cdot d\mathbf{r}$$

so long as the normal $\mathbf{n}$ and the orientation of C are compatible.

In the two problems below you will set up, but **not evaluate** the integrals on both side of this equation where $\mathcal{S}$ is the surface $z = e^{-3(x^2+y^2)}$ with $x^2 + y^2 \leq 1$ and where

$$\mathbf{F} = \langle -y, x, 1 \rangle .$$

The surface is given the orientation with unit normal pointing in the direction given in the figure (generally in the positive z direction.)



1. Compute $\int_C \mathbf{F} \cdot d\mathbf{r}$. Please be careful about orientation/sign.

Recall: $\mathcal{S}$ is the surface $z = e^{-3(x^2+y^2)}$ with $x^2+y^2 \leq 1$ and where and unit normal pointing generally in the positive z direction and that

$$\mathbf{F} = \langle -y, x, 1 \rangle .$$

2. Compute $\iint_{\mathcal{S}} (\nabla \times \mathbf{F}) \cdot \mathbf{n} \, dS$.