Name:

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

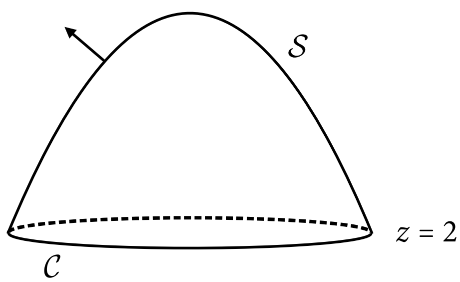
$$\iint_S (\nabla \times \mathbf{F}) \cdot \mathbf{n}\, dS = \int_C \mathbf{F} \cdot d\mathbf{r}$$

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 **paraboloid** $z = 4 - x^2 - y^2$ with $z \geq 2$ and where

$$\mathbf{F} = \langle z, xy, y \rangle .$$

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



1. Write down an integral expressing $\int_C \mathbf{F} \cdot d\mathbf{r}$. Your answer should be of the form $\int_a^b g(t)\, dt$ where a and b are numbers and where $g(t)$ is an explicit function. Please do not compute the integral. Please be careful about orientation/sign.

Recall: $\mathcal{S}$ is the paraboloid $z = 4 - x^2 - y^2$ with $z \geq 2$ and unit normal pointing generally in the z direction and that

$$\mathbf{F} = \langle z, xy, y \rangle .$$

2. Write down an integral expressing $\iint_{\mathcal{S}} (\nabla \times \mathbf{F}) \cdot \mathbf{n}\, dS$. Your answer should be in the form of an iterated integral of an explicit integrand that is a function of two parameter variables. The endpoints of each integral in the iterated integral must be explicit numbers or functions of parameter variables. Please do **not** compute the integral.