**Writing assignment:**

Discuss how Stokes' Theorem applies to the vector fields

$$\vec{F} \;=\; yz\,\hat{\imath} \;+\; xz\,\hat{\jmath} \;+\; xy\,\hat{k} \qquad \text{and} \qquad \vec{G} \;=\; -y\,\hat{\imath} \;+\; x\,\hat{\jmath} \;+\; e^z\,\hat{k}\,,$$

on $S$, the upwards-oriented portion of the graph of $z = 1 - x^2 - y^2$ lying above the $xy$-plane.

**Guide for your work:**

A fully complete writing assignment will include the steps outlined below as well as additional discussion of the key ideas and how they are connected.

(a) State Stokes' Theorem in full, and explain how it **applies** to $\vec{F}$ on $S$. Include a sketch, and make sure to check each hypothesis of Stokes' Theorem.

(b) Verify that the conclusion of Stokes' theorem holds true for $\vec{F}$ on $S$. You will need to evaluate a flux integral and a line integral, and show that they are equal.

- Hint: There is a way to evaluate the line integral without parameterization. Consider the function $f(x, y, z) = xyz$.
- Note: It would be circular to use the Curl Test. (Why?)

(c) Explain how Stokes' Theorem applies to $\vec{G}$ on $S$. Again, make sure to check each hypothesis.

(d) Verify that the conclusion of Stokes' theorem holds true for $\vec{G}$ on $S$.