Q1 Consider the vector field \( \mathbf{F} = y^3 z \mathbf{i} + y \mathbf{j} + k \). Let \( S \) be the surface \( z = y - 2 \) lying within \( x^2 + y^2 = 1 \).

(a) Find outward unit normal vector to surface \( S \).

(b) Find flux of \( \mathbf{F} \) through surface \( S \) given by \( \iiint_S (\mathbf{F} \cdot \mathbf{n}) \, ds \).