Problem statement Suppose $\mathbf{H}$ is a vector field of the form $\mathbf{H}(x, y, z) = h(x, y, z)(x\mathbf{i}+y\mathbf{j})$, where $h(x, y, z)$ is a positive scalar function. If S is the closed surface which is the boundary of the solid region bounded below by the paraboloid $z = x^2 + y^2$ and above by the plane $z = 4$, with positive (outward) orientation, is the integral $\iint_S \mathbf{H} \cdot d\mathbf{S}$ positive, negative, or zero?