

1. Let S be the part of the paraboloid $2x^2 + 2y^2 + z = 50$ which lies above the xy -plane. Assume x , y , and z are measured in millimeters. Suppose S is coated with chocolate, and that the density of chocolate is $\sigma = x^2 + y^2$ milligrams per square millimeter. How much total chocolate is there?
2. Suppose $\vec{\nabla} \cdot \vec{F} = xyz^2$.
 - (a) Find $\vec{\nabla} \cdot \vec{F}$ at the point $(1, 2, 1)$.
Note: You are given $\vec{\nabla} \cdot \vec{F}$, not \vec{F} !
 - (b) Using your answer to part (a), but no other information about the vector field \vec{F} , estimate the flux out of a small box of side 0.2 centered at the point $(1, 2, 1)$ and with edges parallel to the axes.
 - (c) Without computing the vector field \vec{F} , calculate the exact flux out of the box.