

Note: This is a concept-based section, I would recommend trying to think about what is going on in the problems before simply pushing buttons and pulling levers.

1. Let $\mathbf{F}(x, y, z) = \langle \ln(z^2 + 1)y^y, x \cdot \ln(z^2 + 1)(1 + \ln(y))y^y + x, \frac{2xz}{z^2 + 1}y^y \rangle$. Calculate the line integral of \mathbf{F} along the line $r(t) = \langle t, t, 6t \rangle, 0 \leq t \leq 6$. [Note: it may help to remember that $y = e^{\ln(y)}$ and therefore $y^y = e^{y \ln(y)}$]

2. Let $\mathbf{F} = \langle z^{3/2} \ln(y) + y^2, x + z^3 \cos(x), z^2 x^2 y \rangle$. Calculate the flux of F across the unit sphere.

3. Let V be the filled in pyramid with corners $(0, 0, 0), (0, 3, 2), (1, 1, 1), (3, 2, -4)$. Calculate the volume integral of $f(x, y, z) = x$ on this volume.