Aalto university
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Demonstration exercises 4, done during class Thursday 25.3.2021 or Friday 26.3.2021.
Differential and integral calculus 3, MS-A0311

The solutions will be presented by the assistant during class.

(1) Find the flux of

$$F(x,y,z) = \left(\frac{2x}{x^2+y^2}, \frac{2y}{x^2+y^2}, 1\right)$$

downward through the surface $\mathcal{S}$ defined parametrically by $\vec{r}(u,v) = (u\cos v, u\sin v, u^2);\ \ (0 \le u \le 1, 0 \le v \le 2\pi)$.

(2) Calculate the flux of $F(x,y,z) = (4x, 4y, 2)$ downwards through the part of $z = x^2 + y^2$ where $0 \le z \le 1$.

(3) Let $a > 0$. Calculate the flux of the vector field $F(x,y,z) = (y, -x, 1)$ across the portion of the sphere $x^2 + y^2 + z^2 = a^2$ in the first octant (where x, y, and z are positive) in the direction away from the origin.