Aalto university
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Homework 5, due April 5th March 2021 at 23:59.
Differential and integral calculus 3, MS-A0311.

The solutions will be presented Tuesday 6.4 or Wednesday 7.4.

(1) Calculate the flux of $F(x, y, z) = (x^2, xz, 3z)$ outward across the sphere $x^2 + y^2 + z^2 = 4$. (4p)

(2) Calculate the flux of $F(x, y, z) = (x^2, y^2, z^2)$ outward across the boundary of the domain

$$D = \left\{(x, y, z) \in \mathbb{R}^3; (x-2)^2 + y^2 + (z-3)^2 \leq 9\right\}.$$

(4p)

(3) Assume that $\mathcal{S}$ is an orientable smooth surface that is the boundary of a regular domain D in $\mathbb{R}^3$. Assume that F is a smooth vector field on $\mathbb{R}^3$. Show that

$$\oiint_{\mathcal{S}} (\operatorname{Curl} F) \cdot N \, dS = 0.$$

(4p)