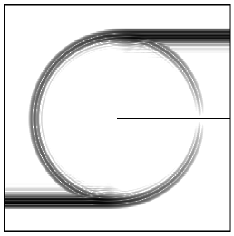
$$\frac{\partial}{\partial t}\underline{\boldsymbol{B}} = -\nabla \times \underline{\boldsymbol{E}}$$
$$\frac{\partial}{\partial t}\underline{\boldsymbol{D}} = \nabla \times \underline{\boldsymbol{H}}$$



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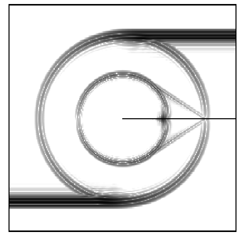


$$\frac{\partial}{\partial t}\underline{\boldsymbol{p}} = \nabla \cdot \underline{\underline{\boldsymbol{T}}}$$
$$\frac{\partial}{\partial t}\underline{\underline{\boldsymbol{S}}} = \mathrm{sym}\{\nabla \underline{\boldsymbol{v}}\}$$

Exercises for Electromagnetic Field Theory I
(EFT I)
SS 2002

University of Kassel
Department of EE/CS
Electromagnetic Theory

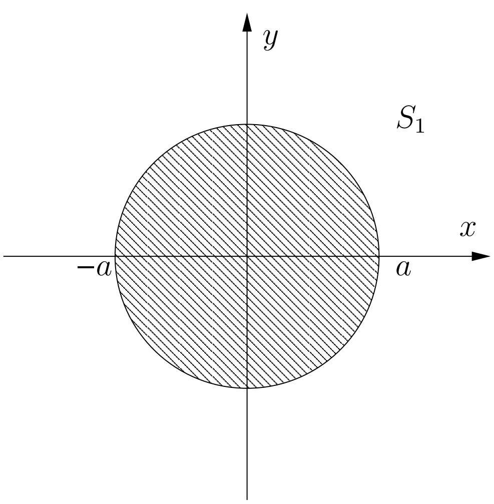
Sheet 1

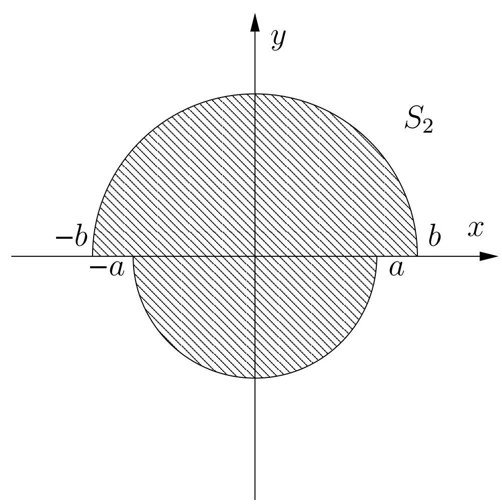
Exercise 1

Given is the electric flux density

$$\underline{\mathbf{D}}(\underline{\mathbf{R}}) = D_0(z\cos\varphi\underline{\mathbf{e}}_r + z\sin\varphi\underline{\mathbf{e}}_\varphi + r\underline{\mathbf{e}}_z)$$

Calculate the flux that flows in positive z-direction through the two hatched surfaces S_1 and S_2 that lie in the xy plane with $z = 0$.

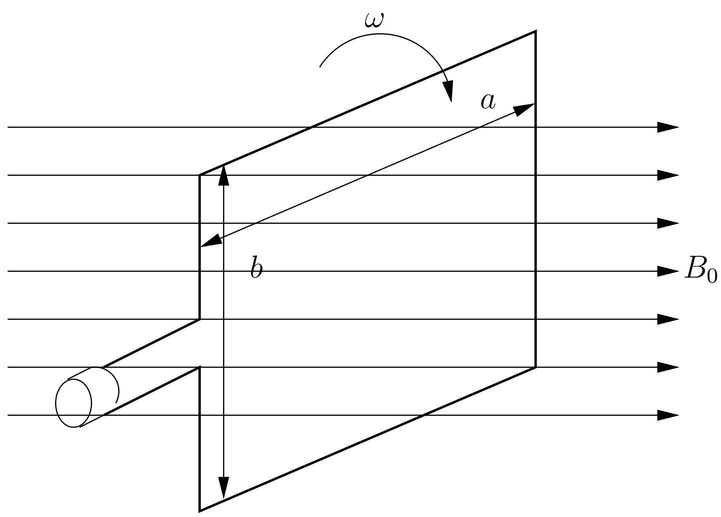




Hint: Use a cylindrical coordinate system.

Exercise 2 (ac-generator)

Consider a rectangular wire loop rotating in a uniform magnetic field.



a) Derive the electric voltage induced in the wire loop.

b) Draw a sketch of the induced voltage as a function of time.

c) How can this ac-generator be turned into a dc-generator?