

## Werk

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#### Summary

# A NOTE ON PERIMETER OF THE CARTESIAN PRODUCT OF TWO SETS

### Josef Král, Praha

Denote by  $\mathscr V$  the system of all infinitely differentiable vector-valued functions  $v = [v_1, ..., v_k]$  on  $E_k$  with v(z) = 0 for sufficiently large |z|. Further, let  $\mathscr V^1$  be the system of all  $v \in \mathscr V$  with max  $|v(z)| \le 1$ ,  $z \in E_k$ . For every Lebesgue measurable set  $C \subset E_k$  the perimeter ||C|| of C is defined by

$$||C|| = \sup_{v \in \mathscr{V}^1} \int_C \operatorname{div} v(z) \, \mathrm{d}z.$$

It is known that  $||C|| < \infty$  is a necessary and sufficient condition for the existence of a finite Borel measure  $P_C$  over the boundary  $H_C$  of C and a Borel measurable vector-valued function  $v^C = \begin{bmatrix} v_1^C, ..., v_k^C \end{bmatrix}$  on  $H_C$  such that

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(i) 
$$v \in \mathscr{V} \Rightarrow \int_{H_C} v \cdot v^C dP_C = \int_C \operatorname{div} v(z) dz$$
,

(ii) 
$$|v^{C}(z)| = 1$$
 for  $P_{C}$  - almost every  $z \in H_{C}$ 

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((i), (ii) determine  $P_C$  uniquely and  $v^C$  almost uniquely with respect to  $P_C$ ). Suppose now that k = r + s, where r, s are positive integers. Denote by  $L_m$  the m-dimensional Lebesgue measure. It is proved that, for arbitrary Lebesgue measurable sets  $A \subset E_r$ ,  $B \subset E_s$ , the formula

$$||A \times B|| = ||A|| \cdot L_s B + L_r A \cdot ||B||$$

is true. In particular,  $||A \times B|| < \infty$  whenever  $||A|| + ||B|| + L_rA + L_sB < \infty$ ; in the latter case the structure of the measure  $P_C$ , corresponding to  $C = A \times B$ , is simply described by means of  $P_A \times L_s$ ,  $L_r \times P_B$ .

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