

*On Representation of Stream Functions of Subsonic  
and Supersonic Flows of Compressible Fluids\**

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**Introduction.** One of the aims of the modern theory of partial differential equations is the unification of methods. In particular, it seems of great interest to develop the theory of compressible fluids sufficiently that at least in the subsonic case we can use various procedures which were proved to be successful in the case of incompressible fluids, and to derive explicit formulas for stream functions of various types. This particular problem seems to be of comparative importance today: the development of modern computational machinery will permit in the not too distant future evaluation of rather complicated formulas.

The present paper consists of two parts. In §§1-4 we consider flows of compressible fluids in the pseudo-logarithmic plane, *i.e.*, a plane whose cartesian coordinates are  $\lambda$  and  $\theta$ .  $\lambda$  is a function of the speed (see (1.3a)) and  $\theta$  is the angle which the velocity vector forms with the positive  $x$ -direction of the physical plane. The differential equations of motion for the stream function in the case of subsonic flows assume a very simple form (see (1.2b) or (1.4b)). To a flow which in the physical plane is bounded by segments of straight lines and segments of free boundaries corresponds in the pseudo-logarithmic plane a flow bounded by segments of lines which are parallel to the axes  $\lambda$  and  $\theta$ . The main complication arising in this case is the fact that in the pseudo-logarithmic plane the stream functions of flows of this type are defined, in general, on a Riemann surface. In §§1-4 we consider flows of this type and define operators transforming analytic functions of a complex variable into stream functions (defined in the pseudo-logarithmic plane) yielding flow patterns of the desired type in the physical plane.

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