

General exact solution for homogeneous time-dependent self-gravitating perfect fluids

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A procedure to obtain the general exact solution of Einstein equations for a self-gravitating spherically symmetric static perfect fluid obeying an arbitrary equation of state is applied to time-dependent Kantowski-Sachs line elements (with spherical, planar, and hyperbolic symmetry). As in the static case, the solution is generated by an arbitrary function of the independent variable and its first derivative. To illustrate the results, the whole family of (plane-symmetric) solutions with a "gamma-law" equation of state is explicitly obtained in terms of simple known functions. It is also shown that, while in the static plane-symmetric line element, every metric is in one to one correspondence with a "partner metric" (both originated from the same generatrix function); in this case every generatrix function uniquely determines one metric. © 1989 American Institute of Physics.