HOW TO DISCRETIZE THE PRESSURE GRADIENT FOR CURVILINEAR MAC GRIDS. Robert S. Bernard and Hartmut Kapitza, *CE-WESHS-R, U.S. Army Engineer Waterways Experiment Station, 3909 Halls Ferry Road, Vicksburg, Mississippi 39180, USA.*

Curvilinear coordinates present certain difficulties for incompressible flow calculations with marker-and-cell (MAC) grids. Among these are questions regarding the discretization of derivatives in the pressure gradient, which should remain irrotational while maintaining conservation of mass. This paper examines alternative approximations for pressure derivatives next to the boundaries and for coordinate derivatives throughout the flow. Several combinations of alternatives are tested for their ability to remove continuity violations, without adding vorticity, in channels that have been fitted with non-orthogonal MAC grids. Each of these combinations achieves conservation of mass, but only one of them makes the pressure gradient effectively irrotational. The latter condition is achieved by using identical approximations for coordinate derivatives and pressure derivatives throughout the flow, and by using one-sided approximations next to the boundaries for ambiguous derivatives in the off-boundary direction.

A DOMAIN DECOMPOSITION METHOD FOR GENERATING ORTHOGONAL POLYNOMIALS FOR A GAUSSIAN WEIGHT ON A FINITE INTERVAL. Raymond C. Y. Chin, *Lawrence Livermore National Laboratory, Livermore, California 94550, USA.*

A domain decomposition method has been developed for generating orthogonal polynomials for a Gaussian weight on $(-1, 1)$. The method takes advantage of the underlying asymptotic structure of the orthogonal polynomials and, hence, it is *effective* in the sense that it makes maximal use of the analytic properties of the solution to increase accuracy and efficiency. These polynomials are necessary for constructing Gaussian quadrature formulas that are encountered in large quantum chemistry computational packages and in calculating the Compton scattering kernel and its associated angular moments.

A MICROINSTABILITY CODE FOR A UNIFORM MAGNETIZED PLASMA WITH AN ARBITRARY DISTRIBUTION FUNCTION. Y. Matsuda and Gary R. Smith, *Lawrence Livermore National Laboratory, Livermore, California 94550, USA.*

We have developed a very general computer code for studying microinstabilities in a uniform magnetized plasma. Employing a new algorithm to perform two-dimensional numerical integrals in the conductivity tensor, the code can handle an arbitrary distribution function, given by either an analytical function or numerical values on a momentum space grid, and solve the full dispersion relation for an arbitrary propagation angle in either a non-relativistic or relativistic plasma except for a highly relativistic plasma (energy $\gg 1$ MeV). The results for cyclotron–maser instability and whistler–wave instability are presented to illustrate the validity of the method.

HARMONIC STOKES FLOW THROUGH PERIODIC POROUS MEDIA. A 3D BOUNDARY ELEMENT METHOD. Lionel Borne, *Institut Franco-Allemand de Recherches de Saint-Louis, 12, rue de L'Industrie, 68301 Saint-Louis Cedex, FRANCE.*

Our interest is in dynamic filtration through periodic, porous, saturated media. More precisely, we develop here a three-dimensional numerical model, based on boundary elements methods, to compute the dynamic permeability over a wide range of such media. This generalized Darcy coefficient is obtained by the homogenization process applied to a periodic, deformable, porous medium under dynamic solicitations. An unusual choice of Green functions is made. A simple numerical procedure is used for