In this case *ln* x does not itself involve division but, when one forms the Jacobian element $\partial f/\partial x = 1/x - 1$, we have a division, which if x becomes zero will destroy the N-R equations by giving an infinite coefficient.

SUMMARY

Advantages/Disadvantages of Tearing vs. N-R with Sparse Matrix Methods

- Tearing is the more commonly used method.
- Tearing requires much less computer storage, usually.
- Tearing can be made quite efficient, particularly if all variables to be iterated are converged together, rather than solved with loops imbedded inside loops.
- Newton-Raphson approach is really very good if done correctly. We regularly solve hundreds of equations in 5 to 10 iterations total.
- The AERE Harwell subroutine MA28* is readily available to perform all the sparse matrix-equation solving portion of the problem.
- N-R requires Jacobian elements be evaluated or estimated. We find this easy to do because we add new variables to keep the algebra simple.
- Newton-Raphson approach permits sensitivity calculations to be performed easily and for little computational effort. □

REFERENCE

Westerberg, A. W., H. P. Hutchison, R. L. Motard, P. Winter, *Process Flowsheeting*, Cambridge University Press, Cambridge, England (1979).

*Contact: Numerical Analysis Group, Bldg. 8.9, AERE Harwell, OX11RA, England. The routine MA28 is part of the Harwell library of scientific routines which is available for £150. (Very cheap at that price.)

In Memorium

JOHN D. STEVENS

John D. Stevens, professor of Chemical Engineering at Iowa State University, died April 1, 1980, after a short illness. He was a faculty member at Iowa State for 15 years, during which time he received several teaching awards including the Western Electric Fund Award. He had served as National President of Omega Chi Epsilon. Dr. Stevens published several papers in the area of emulsion polymerization and crystallization.

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