ALGORITHM 51
ADJUST INVERSE OF A MATRIX WHEN AN ELEMENT IS PERTURBED

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```
procedure ADJUST (n, d, i, j, A, B); value i, j, n, d;
          integer i, j, n; real d; real array A, B;
comment If the n × n matrix A=M⁻¹ and a change, d, is made
  in the i, j-th element of M this procedure will calculate the
  corrected matrix for M⁻¹ by adjusting matrix A. The adjusted
  matrix is stored in B;
begin     integer r, s;
          real t;
          t := d/(A[j, i] × d+1);
          for r := 1 step 1 until n do
            begin for s := 1 step 1 until n do
              B[r, s] = A[r, s] − t × A[r, i] × Aj, s] end
end ADJUST
```

CERTIFICATION OF ALGORITHM 51
ADJUST INVERSE OF A MATRIX WHEN AN ELEMENT IS PERTURBED [John R. Herndon, *Comm. ACM 4* (Apr. 1961)]

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This procedure was programmed in FORTRAN and reduced to machine code mechanically. It was run on the Argonne-built computing machine, GEORGE. A floating-point routine was used which allows maximum accuracy to 31 bits.

The procedure was tested for matrices with n ranging from 2 to 10. For each value of n, there were 20 successive trials; each trial consisted of a random perturbation of a randomly selected element of the matrix M, followed by a use of ADJUST, followed by the matrix multiplication N := B·M. For each trial, the adjustment was evaluated by computing

$$\text{sum} := \left\{\sum_{i=1}^{n}\sum_{j=1}^{n} N[i,j]\right\} - n.$$

For random perturbations between −1.0 and +1.0, the value of sum never exceeded $2.0_{10}-8$.

There are two typographical errors present:

```
B[r,s]=A[r,s]−t×A[r,i]×Aj,s] end
```

should be

```
B[r,s] := A[r,s]−t×A[r,i]×A[j,s] end
```

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