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C   USE UMCGG_INT
C   USE UMACH_INT
C   Declaration of variables
INTEGER N
PARAMETER (N=4)
INTEGER I,MAXFN, NOUT
REAL DFPRED, FVALUE, G(N), GRADTL, X(N), XGUESS(N)
EXTERNAL WOODS, WOODSGRD,UMACH,UMCGG
DATA XGUESS/-3.0E0, -1.0E0, -3.0E0, -1.0E0/
DFPRED = 0.2
GRADTL = 1.0E-5
MAXFN=1000
C   Minimize the Woods function
CALL UMCGG(WOODS, WOODSGRD,N, XGUESS,
& GRADTL, MAXFN,DFPRED,X,G, FVALUE)
C   Print the results
CALL UMACH(2, NOUT)
WRITE (NOUT,99999) (X(I),I=1,N), FVALUE, (G(I),I=1,N)
99999 FORMAT(' The solution is ', 4F8.3, //, 'The function ',
& 'evaluated at the solution is ', F8.3, //, ' The ',
& 'gradient is ', 4F8.3, /)
END

SUBROUTINE WOODS (N, X, F)
INTEGER N
REAL X(N), F
T1=100.0E0*(X(2)-X(1)**2)**2+(1.0E0-X(1))**2
T2=90.0E0*(X(4)-X(3)**2)**2+(1.0E0-X(3))**2
T3=10.1E0*((X(2)-1.0E0)**2+(X(4)-1.0E0)**2)
T4=19.8E0*(X(2)-1.0E0)*(X(4)-1.0E0)
F=T1+T2+T3+T4
WRITE (NOUT,555) (X(I),I=1,N), F
555  FORMAT('X is',4F8.3//,'Function=',F8.3/)
RETURN
END

SUBROUTINE WOODSGRD (N, X, G)
INTEGER N
REAL X(N), G(N)
G(1)=-400.0E0*(X(2)-X(1)**2)*X(1)-2.0E0+2*X(1)
G(2)=220.2E0*X(2)-200.0E0*X(1)**2-40.0E0+19.8E0*X(4)
G(3)=-360.0E0*(X(4)-X(3)**2)*X(3)-2.0E0+2.0E0*X(3)
G(4)=200.2E0*X(4)-180.0E0*X(3)**2-40.0E0+19.8E0*X(2)
WRITE (NOUT,555) (G(I),I=1,N), G

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555  FORMAT('G is',4F8.3//)
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RETURN
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END
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