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#COMPILE EXE
#DIM ALL
REM *** viscous flow over a wall, an elementary example
GLOBAL i,j,iter,dt,dx,dy,dwdx,dwdy,kvisc AS SINGLE
GLOBAL d2wdx2,d2wdy2,wsor,iter,a,V,tt,ypos,zz AS SINGLE
FUNCTION PBMAIN
DIM w(45,25,2) AS SINGLE:DIM psi(45,25) AS SINGLE
DIM vx(45,25) AS SINGLE:DIM vy(45,25) AS SINGLE
kvisc=0.01:V=1:dy=4/24:dx=dy:wsor=1.9:dt=0.005:a=V/4
REM *** set psi across bottom
FOR j=1 TO 15
FOR i=1 TO 45
psi(i,j)=0
NEXT i:NEXT j
tt=dt
100 REM *** set psi for inlet and exit and top wall
FOR j=1 TO 25
ypos=(j-1)*dy
psi(1,j)=a/2*ypos^2*(1-EXP(-1*tt))
IF tt>3 THEN 120 ELSE 110
110 REM *** continue
psi(45,j)=a/2*ypos^2*(1-EXP(-1*tt))
120 REM *** continue
NEXT j
FOR i=2 TO 45
psi(i,25)=psi(1,25)
NEXT i
REM *** get vorticity on all boundaries
FOR j=2 TO 24
w(1,j,1)=-((psi(1,j+1)-2*psi(1,j)+psi(1,j-1)))/dy^2
w(45,j,1)=-((psi(45,j+1)-2*psi(45,j)+psi(45,j-1)))/dy^2
NEXT j
FOR i=2 TO 44
w(i,25,1)=-((psi(i,25)-2*psi(i,24)+psi(i,23)))/dy^2
NEXT i
FOR i=2 TO 15
w(i,1,1)=-((psi(i,1)-2*psi(i,2)+psi(i,3)))/dy^2
NEXT i
FOR i=18 TO 44
w(i,1,1)=-((psi(i,1)-2*psi(i,2)+psi(i,3)))/dy^2
NEXT i
FOR j=2 TO 13
w(16,j,1)=-((psi(16,j,1)-2*psi(15,j,1)+psi(14,j,1)))/dx^2
w(17,j,1)=-((psi(17,j,1)-2*psi(18,j,1)+psi(19,j,1)))/dx^2
NEXT j
w(16,14,1)=-((psi(16,14)-2*psi(16,15)+psi(16,16)))/dy^2-((psi(16,14)-
2*psi(15,14)+psi(14,14)))/dx^2
w(17,14,1)=-((psi(17,14)-2*psi(17,15)+psi(17,16)))/dy^2-((psi(17,14)-
2*psi(18,14)+psi(19,14)))/dx^2
REM *** get velocities everywhere in the interior from stream function
FOR j=2 TO 24
FOR i=2 TO 44
vx(i,j)=(psi(i,j+1)-psi(i,j-1))/(2*dy)
vy(i,j)=-((psi(i+1,j)-psi(i-1,j)))/(2*dx)
NEXT i:NEXT j

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REM *** call up routine to get updated vorticity
  FOR j=2 TO 14
    FOR i=2 TO 15
      GOSUB 800
    NEXT i
    FOR i=18 TO 44
      GOSUB 800
    NEXT i
    NEXT j
    FOR j=15 TO 24
      FOR i=2 TO 44
        GOSUB 800
      NEXT i:NEXT j
REM *** use new vorticity to revise stream function in the interior
  iter=1
250 REM *** continue
  FOR j=2 TO 14
    FOR i=2 TO 15
      GOSUB 900
    NEXT i
    FOR i=18 TO 44
      GOSUB 900
    NEXT i
    NEXT j
    FOR j=15 TO 24
      FOR i=2 TO 44
        GOSUB 900
      NEXT i:NEXT j
      iter=iter+1
      IF iter<150 THEN 250 ELSE 300
300 REM *** continue and flop interior vorticities
  FOR j=2 TO 14
    FOR i=2 TO 15
      w(i,j,1)=w(i,j,2)
    NEXT i
    FOR i=18 TO 44
      w(i,j,1)=w(i,j,2)
    NEXT i
    NEXT j
    FOR j=15 TO 24
      FOR i=2 TO 44
        w(i,j,1)=w(i,j,2)
      NEXT i:NEXT j
  tt=tt+dt
  PRINT tt,psi(19,6)
  FOR j=2 TO 24
    psi(45,j)=1/3*(4*psi(44,j)-psi(43,j))
  NEXT j
  IF tt<11 THEN 100 ELSE 400
400 REM *** continue
  OPEN "c:floOVERwall.dat" FOR OUTPUT AS #1
  FOR j=1 TO 25
    FOR i=1 TO 45
      WRITE#1,i,j,psi(i,j)
    NEXT i:NEXT j

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INPUT "Shall we continue?";zz
IF zz>0 THEN CLOSE
END

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800 REM *** compute updated vorticity
d2wdx2=(w(i+1,j,1)-2*w(i,j,1)+w(i-1,j,1))/dx^2
d2wdy2=(w(i,j+1,1)-2*w(i,j,1)+w(i,j-1,1))/dy^2
IF vx(i,j)>0 THEN dwdx=(w(i,j,1)-w(i-1,j,1))/dx ELSE dwdx=(w(i+1,j,1)-w(i,j,1))/dx
IF vy(i,j)>0 THEN dwdy=(w(i,j,1)-w(i,j-1,1))/dx ELSE dwdy=(w(i,j+1,1)-w(i,j,1))/dx
w(i,j,2)=dt*kvisc*(d2wdx2+d2wdy2)-dt*(vx(i,j)*dwdx+vy(i,j)*dwdy)+w(i,j,1)
RETURN

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900 REM *** iterative calc of psi from new vorticity

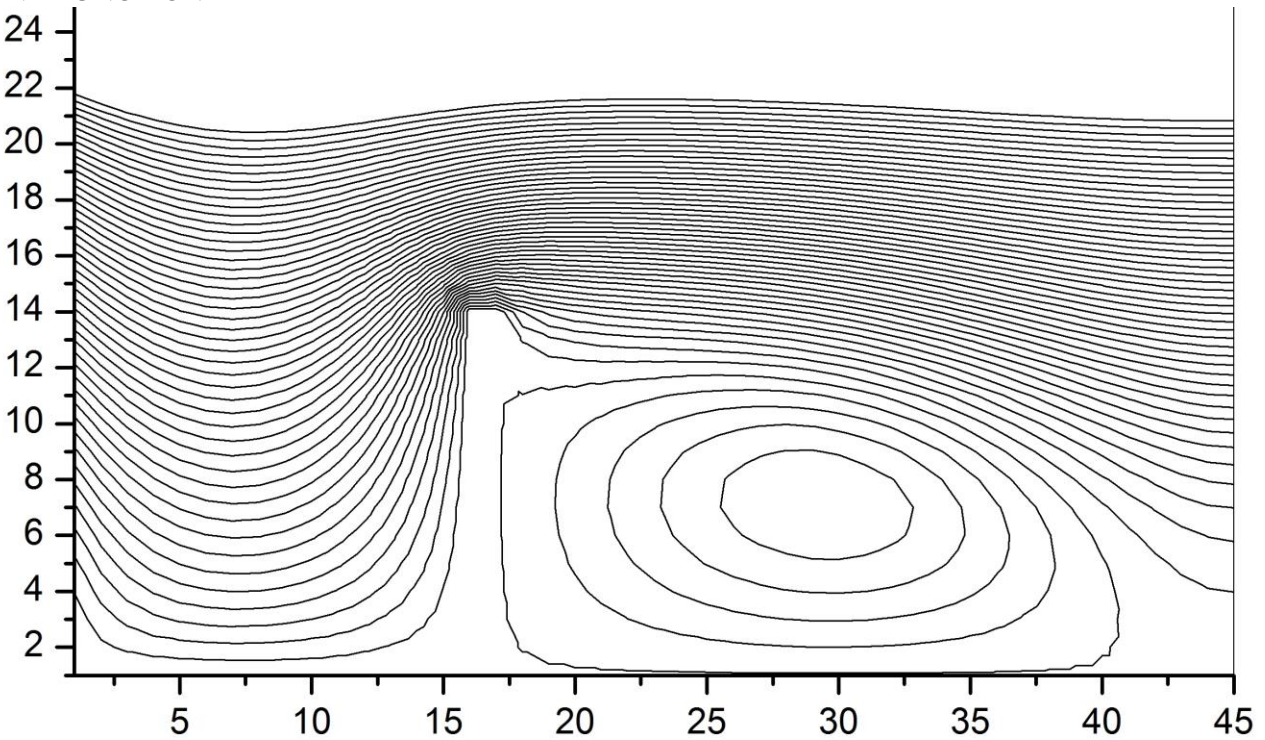
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910 REM *** continue
psi(i,j)=psi(i,j)+wsor/4*(-w(i,j,2)*dx^2+psi(i+1,j)+psi(i-1,j)+psi(i,j+1)+psi(i,j-1)-
4*psi(i,j))
RETURN

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END FUNCTION



Re=400, t=11 s

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