```
 1: program EDO2EULER
 2: PARAMETER (NNN = 100000)
 3: implicit real*8 (a-h,o-z)
 4: PARAMETER (PI = ACOS(-1.0))
 5: real*8 L0,L1,L2,L3,L4,L5,K0,K1,K2,K3,K4,K5,DIFF,EXATA,X
 6: Dimension Y(0:NNN)
 7: Dimension Z(0:NNN)
 8: open(14,file="dados-13do03exerc02.txt")
 9: open(15,file="erro-13do03exerc02.txt")
10: H = 0.001d0
11: NSTEP = int(20.d0/H)
12: Y(0) = PI/180.d0
13: Z(0) = 0.d0
14: DO 10 IX = 0, NSTEP-1
15:    X = IX*H
16:    K0 = H*Z(IX)
17:    L0 = H*FUNC(X,Y(IX),Z(IX))
18:    K1 = H*(Z(IX) + L0/4.d0)
19:    L1 = H*FUNC((X + H/4.d0),(Y(IX) + K0/4.d0),(Z(IX) + L0/4.d0))
20:    K2 = H*(Z(IX) + 3.d0*L0/32.d0 + 9.d0*L1/32.d0)
21:    L2 = H*FUNC((X + 3.d0*H/8.d0),(Y(IX) + 3.d0*K0/32.d0 + 9.d0*K1/32.d0),(Z(IX) +
    3.d0*L0/32.d0 + 9.d0*L1/32.d0))
22:    K3 = H*(Z(IX) + 1932.d0*L0/2197.d0 - 7200.d0*L1/2197.d0 + 7296.d0*L2/2197.d0)
23:    L3 = H*FUNC((X + 12.d0*H/13.d0),(Y(IX) + 1932.d0*K0/2197.d0 - 7200.d0*K1/2197.d0
    + 7296.d0*K2/2197.d0),&
24:     (Z(IX) + 1932.d0*L0/2197.d0 - 7200.d0*L1/2197.d0 + 7296.d0*L2/2197.d0))
25:    K4 = H*(Z(IX) + 439.d0*L0/216.d0 - 8.d0*L1 + 3680.d0*L2/513.d0 -
    845.d0*L3/4104.d0)
26:    L4 = H*FUNC((X + H),(Y(IX) + 439.d0*K0/216.d0 - 8.d0*K1 + 3680.d0*K2/513.d0 -
    845.d0*K3/4104.d0),&
27:     (Z(IX) + 439.d0*L0/216.d0 - 8.d0*L1 + 3680.d0*L2/513.d0 - 845.d0*L3/4104.d0))
28:    K5 = H*(Z(IX) - 8.d0*L0/27.d0 + 2.d0*L1 - 3544.d0*L2/2565.d0 + 1859.d0*L3/4104.d0
    - 11.d0*L4/40.d0)
29:    L5 = H*FUNC((X + H/2.d0),(Y(IX) - 8.d0*K0/27.d0 + 2.d0*K1 - 3544.d0*K2/2565.d0 +
    1859.d0*K3/4104.d0 - 11.d0*K4/40.d0),&
30:     (Z(IX) - 8.d0*L0/27.d0 + 2.d0*L1 - 3544.d0*L2/2565.d0 + 1859.d0*L3/4104.d0 -
    11.d0*L4/40.d0))
31:    Y(IX+1) = Y(IX) + (25.0d0/216.0d0*K0 + 1408.0d0/2565.0d0*K2 +
    2197.0d0/4104.0d0*K3 - 1.0d0/5.0d0*K4)
32:    Z(IX+1) = Z(IX) + (25.0d0/216.0d0*L0 + 1408.0d0/2565.0d0*L2 +
    2197.0d0/4104.0d0*L3 - 1.0d0/5.0d0*L4)
33:    DIFF = EXATA(X+H)-Y(IX+1)
34:    erro = dabs(DIFF/EXATA(X+H))
35:    write(14,*)X+H,Y(IX+1),EXATA(X+H)
36:    WRITE(15,*)erro
37: 10 CONTINUE
38: end
39:
40: real*8 function FUNC(X,Y,Z)
41:      implicit real*8 (a-h,o-z)
42:      FUNC = -(9.8d0/1.5d0)*Y
43: end
44:
45: real*8 function exata(x)
46:      implicit real*8 (a-h,o-z)
47:      PARAMETER (PI = ACOS(-1.0))
48:      exata = (PI/180.d0)*dcos(dsqrt(9.8d0/1.5d0)*x)
49: end
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