**main.f90**

! program rungekinc

 external fcn

 open(1,file='inpaula.txt')

 open(2,file='outnum.txt')

 open(3,file='outteo.txt')

 open(4,file='outexemplo.txt')

!

! integrador de EDO's com passo fixo - RK 4a ordem

!

 read(1,\*)n,tau0

 write(\*,\*)'n=',n,'tau0=',tau0

 read(1,\*) tend,dtau,teta0

 write(\*,\*)'tend=',tend,'dtau=',dtau,'teta0=',teta0

!

! initial values

!

 erro=0.

 teta=teta0

 tetateo=teta0

 time=tau0

 k=0

 write(\*,\*) ' Tabela de resultados'

 write(\*,\*)'---------------------------------------------------------------------'

 write(\*,\*)' Passo Nr t x(t) xteo(t) Erro (ETL)'

 write(\*,\*)'---------------------------------------------------------------------'

 write(\*,\*)k,time,teta,tetateo,erro

 write(4,\*) ' Tabela de resultados'

 write(4,\*)'---------------------------------------------------------------------'

 write(4,\*)' Passo Nr t x(t) xteo(t) Erro (ETL)'

 write(4,\*)'---------------------------------------------------------------------'

 write(4,\*)k,time,teta,tetateo,erro

 write(2,\*)time,teta

 write(3,\*)time,teta

 50 k=k+1

 th=time+0.5\*dtau

 f1=dtau\*fcn(time,teta)

 f2=dtau\*fcn(th,teta+0.5\*f1)

 f3=dtau\*fcn(th,teta+0.5\*f2)

 f4=dtau\*fcn(time+dtau,teta+f3)

 teta=teta+(f1+2.\*f2+2.\*f3+f4)/6.

 time=time+dtau

 if (time.le.tend) then

 write(\*,\*)k,time,teta

 write(2,\*)time,teta

 ! tetateo=exp(-time\*\*2/2)

 tetateo=time/(0.5+log(time))

 erro=abs(teta-tetateo)

 write(3,\*)time,tetateo

 write(4,\*)k,time,teta,tetateo,erro

 goto 50

 else

 goto 300

 endif

300 continue

 close(2)

 close(3)

 close(4)

 call system('notepad outnum.txt')

 call system('notepad outteo.txt')

 call system('notepad outexemplo.txt')

 call system('wgnuplot dados.gnu') ! gráfico

 stop

 end

!\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

 function fcn(t,f)

 ! aux=-t\*f

 aux=(t\*f-f\*\*2)/t/t

 fcn=aux

 return

 end

!\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

**dados.gnu**

set data style linespoints

set grid

set xlabel 'Tempo t'

set ylabel 'Solução teórica e numérica x(t)'

set title 'Comparação numérico x teórico'

plot 'outnum.txt','outteo.txt'

pause -1

**inpaula.txt**

1 1.d0

3.d0 0.0078125d0 2.d0