```
      PROGRAM Aula30do01exe2
!     driver for routine gauleg
      INTEGER NPOINT
      REAL X1,X2
      PARAMETER(NPOINT=20,X1=2.0,X2=4.0)
      REAL func,xx
      external func
      open(13, file="Aula30do01exe02.txt")
      call xgauleg(func,X1,X2,NPOINT,ss)
      exata = 2.0*sin(8.0) - sin(4.0) + 236.0/3.0 + (cos(8.0) - cos(4.0))/4.0
      ERROR = ABS(exata - ss)/exata*100
      write(13,'(/1x,a,f12.6)') 'Integral por GAULEG:',ss
      write(13,'(1x,a,f12.6)') 'Valor exato da Integral:',exata
      Write(13,*)"ERRO RELATIVO", ERROR, "%"
      END

      SUBROUTINE xgauleg(func,x1,x2,n,xx)
      REAL func,ss,xx,x1,x2,x(n),w(n)
      INTEGER i
      call gauleg(x1,x2,x,w,n)
      xx=0.0
      do 12 i=1,n
        xx=xx+w(i)*func(x(i))
12    continue
      ss = xx
      return
      END

      REAL FUNCTION func(x)
      REAL x
      func = x**3 + x**2 + x*cos(2*x)
      END

      SUBROUTINE gauleg(x1,x2,x,w,n)
      INTEGER n
      REAL x1,x2,x(n),w(n)
      DOUBLE PRECISION EPS
      PARAMETER (EPS=3.d-14)
      INTEGER i,j,m
      DOUBLE PRECISION p1,p2,p3,pp,xl,xm,z,z1
      m=(n+1)/2
      xm=0.5d0*(x2+x1)
      xl=0.5d0*(x2-x1)
      do 12 i=1,m
        z=cos(3.141592654d0*(i-.25d0)/(n+.5d0))
1       continue
          p1=1.d0
          p2=0.d0
          do 11 j=1,n
            p3=p2
            p2=p1
            p1=((2.d0*j-1.d0)*z*p2-(j-1.d0)*p3)/j
11        continue
          pp=n*(z*p1-p2)/(z*z-1.d0)
          z1=z
          z=z1-p1/pp
        if(abs(z-z1).gt.EPS)goto 1
        x(i)=xm-xl*z
        x(n+1-i)=xm+xl*z
        w(i)=2.d0*xl/((1.d0-z*z)*pp*pp)
        w(n+1-i)=w(i)
12    continue
      return
      END
```