```
 1: Program Aula14do01exerc1
 2: COMMON/xm/xmax
 3: COMMON/NN/N
 4: Real xmax, PI, s, xmin, h
 5: parameter (PI = 3.1415926)
 6: dimension ICLOCK(3)
 7: open(13, file="Aula14do01exer1.txt")
 8: call itime(ICLOCK)
 9: write(13,*)"hora inicial",ICLOCK(1),ICLOCK(2),ICLOCK(3)
10: N = 1000
11: xmax = 1.0
12: xmin = -xmax
13: call int3d(xmin, xmax, s)
14: exata = 4.0*PI*(xmax**5)/5.0
15: error = ABS(exata - s)/exata*100
16: write(13, *)"Integral de r^2 sobre um volume esferico"
17: write(13, *)"Raio:", xmax
18: write(13, *)"Repartições (N):", N
19: write(13, *)"Valor exato:", exata
20: write(13, *)"Valor numerico:", s
21: write(13, *)"Erro percentual:", error, "%"
22: call itime(ICLOCK)
23: write(13,*)"hora final",ICLOCK(1),ICLOCK(2),ICLOCK(3)
24: end program
25:
26: Subroutine int3d(x1,x2,ss)
27: real ss,x1,x2,h
28: external h
29: call qtrapz(h,x1,x2,ss)
30: return
31: end
32:
33: Subroutine qtrapz(func,A,B,SS)
34: Real SS, func, soma
35: COMMON/NN/N
36: External func
37: h = (B-A)/N
38: soma = 0.0
39: do i = 1, N-1
40: soma = soma + func(A+i*h)
41: enddo
42: SS = h/2.0 * (func(A) + 2.0*soma + func(B))
43: return
44: end
45:
46: real function z1(x,y)
47: COMMON/xm/xmax
48: real x, y, xmax
49: z1 = -sqrt(ABS(xmax**2 - x**2 - y**2))
50: end
51:
52: real function z2(x,y)
53: COMMON/xm/xmax
54: real x, y, xmax
55: z2 = sqrt(ABS(xmax**2 - x**2 - y**2))
56: end
57:
58: real function y1(x)
59: COMMON/xm/xmax
60: real x, xmax
61: y1 = -sqrt(ABS(xmax**2 - x**2))
62: end
63:
64: real function y2(x)
65: COMMON/xm/xmax
66: real x, xmax
67: y2 = sqrt(ABS(xmax**2 - x**2))
68: end
69:
70: function h(xx)
71: real h, xx, g, y1, y2, x, y, z, ss
72: external g
```

```
 73: COMMON/xyz/x,y,z
 74: x = xx
 75: call qtrapz(g, y1(x), y2(x), ss)
 76: h = ss
 77: return
 78: end
 79:
 80: function g(yy)
 81: real g, yy, f, z1, z2, x, y, z, ss
 82: external f
 83: COMMON/xyz/x,y,z
 84: y = yy
 85: call qtrapz(f, z1(x,y), z2(x,y), ss)
 86: g = ss
 87: return
 88: end
 89:
 90: function f(zz)
 91: real f, zz, func, x, y, z
 92: COMMON/xyz/x,y,z
 93: z = zz
 94: f = func(x,y,z)
 95: return
 96: end
 97:
 98: real function func(x,y,z)
 99: real x,y,z
100: func = x**2+y**2+z**2
101: return
102: end
103:
104:
105:
106:
107:
108:
109:
110:
111:
112:
113:
```