```fortran
 1: Program I3DSimpsonTrapz
 2: COMMON/xm/xmax
 3: COMMON/NN/N
 4: Real xmin, xmax, PI, s1, s2
 5: parameter (PI = acos(-1.0))
 6: dimension ICLOCK(3)
 7: open(13, file="Aula23do01exerc2.txt")
 8: call itime(ICLOCK)
 9: write(13,*)"hora inicial",ICLOCK(1),ICLOCK(2),ICLOCK(3)
10: N = 1000
11: if(MOD(N,2) .NE. 0) N = N+1
12: xmax = 1.0
13: xmin = -xmax
14: call int3DSimpson(xmin, xmax, S1)
15: call int3DTrapz(xmin, xmax, S2)
16: EXATA = 4.0*PI*(xmax**5)/5.0
17: ERROR1 = ABS(EXATA - S1)/EXATA*100
18: ERROR2 = ABS(EXATA - S2)/EXATA*100
19: Write(13,*)"Valor numerico pela Integral de Simpson:", S1
20: Write(13,*)"Valor Exato:", EXATA
21: Write(13,*)"ERRO RELATIVO", ERROR1, "%"
22: write(13,*)"Reparticoes (N):", N
23: write(13,*)"-------------------------------------------------"
24: Write(13,*)"Valor numerico pela Integral Trapezio:",S2
25: Write(13,*)"Valor Exato:", EXATA
26: Write(13,*)"ERRO RELATIVO", ERROR2, "%"
27: write(13,*)"Reparticoes (N):", N
28: call itime(ICLOCK)
29: write(13,*)"hora final",ICLOCK(1),ICLOCK(2),ICLOCK(3)
30: end program
31:
32: Subroutine int3DSimpson(x1,x2,S1)
33: real ss,x1,x2,h
34: external h
35: call simpson(h,x1,x2,S1)
36: return
37: end
38:
39: Subroutine int3DTrapz(x1,x2,S2)
40: real ss,x1,x2,g
41: external g
42: call trapz(g,x1,x2,S2)
43: return
44: end
45:
46: subroutine simpson(func,a,b,S1)
47: COMMON / NN / N
48: h = (b-a)/N
49: soma = func(a)
50: fator = 2
51: do i = 1, N-1
52:     if (fator == 2.) then
53:         fator = 4
54:     else
55:         fator = 2
56:     end if
57:     x = a+i*h
58:     soma = soma + fator*func(x)
59: enddo
60: soma = soma + func(b)
61: S1 = soma * h/3
62: end
63:
64: Subroutine trapz(func,a,b,S2)
65: Real SS, func, soma
66: COMMON/NN/N
67: External func
68: h = (b-a)/N
69: soma = 0.0
70: do i = 1, N-1
71: soma = soma + func(a+i*h)
72: enddo
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 73: S2 = h/2.0 * (func(a) + 2.0*soma + func(b))
 74: return
 75: end
 76:
 77: real function z1(x,y)
 78: COMMON/xm/xmax
 79: real x, y
 80: z1 = -sqrt(ABS(xmax**2 - x**2 - y**2))
 81: end
 82:
 83: real function z2(x,y)
 84: COMMON/xm/xmax
 85: real x, y
 86: z2 = sqrt(ABS(xmax**2 - x**2 - y**2))
 87: end
 88:
 89: real function y1(x)
 90: COMMON/xm/xmax
 91: real x
 92: y1 = -sqrt(ABS(xmax**2 - x**2))
 93: end
 94:
 95: real function y2(x)
 96: COMMON/xm/xmax
 97: real x
 98: y2 = sqrt(ABS(xmax**2 - x**2))
 99: end
100:
101: function h(xx)
102: real h, xx, k, y1, y2, s1
103: external k
104: COMMON/xrange/xmin,xmax
105: COMMON/xyz/x,y,z
106: x = xx
107: call simpson(k, y1(x), y2(x), s1)
108: h = s1
109: return
110: end
111:
112: function g(xx)
113: real g, xx, j, y1, y2, s2
114: external j
115: COMMON/xrange/xmin,xmax
116: COMMON/xyz/x,y,z
117: x = xx
118: call trapz(j, y1(x), y2(x), s2)
119: g = s2
120: return
121: end
122:
123: function k(yy)
124: real k, yy, f, z1, z2, s1
125: external f
126: COMMON/xrange/xmin,xmax
127: COMMON/xyz/x,y,z
128: y = yy
129: call simpson(f, z1(x,y), z2(x,y), s1)
130: k = s1
131: return
132: end
133:
134: function j(yy)
135: real j, yy, f, y1, y2, s2
136: external f
137: COMMON/xrange/xmin,xmax
138: COMMON/xyz/x,y,z
139: y = yy
140: call trapz(f, z1(x,y), z2(x,y), s2)
141: j = s2
142: return
143: end
144:
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145:
146: function f(zz)
147: real f, zz, x, y, z
148: COMMON/xyz/x,y,z
149: z = zz
150: f = func(x,y,z)
151: return
152: end
153:
154: real function func(x,y,z)
155: real x,y,z
156: func = x**2 + y**2 + z**2
157: return
158: end
```