```
 1: Program Aula23do01exerc1
 2: COMMON/xm/xmax
 3: COMMON/NN/N
 4: Real xmin, xmax, PI, s1, s2
 5: parameter (PI = acos(-1.0))
 6: open(13, file="Aula23do01exerc1.txt")
 7: N = 100
 8: if(MOD(N,2) .NE. 0) N = N+1
 9: xmax = 2.0
10: xmin = 0
11: call int2DSimpson(xmin, xmax, S1)
12: call int2DTrapz(xmin, xmax, S2)
13: EXATA = PI
14: ERROR1 = ABS(EXATA - S1)/EXATA*100
15: ERROR2 = ABS(EXATA - S2)/EXATA*100
16: write(13, *)"Integral Dupla de X^2 + 4Y^2"
17: Write(13,*)"Valor numerico pela Integral de Simpson:", S1
18: Write(13,*)"Valor Exato:", EXATA
19: Write(13,*)"ERRO RELATIVO", ERROR1, "%"
20: write(13,*)"Reparticoes (N):", N
21: write(13,*)"-------------------------------------------------"
22: Write(13,*)"Valor numerico pela Integral Trapezio:",S2
23: Write(13,*)"Valor Exato:", EXATA
24: Write(13,*)"ERRO RELATIVO", ERROR2, "%"
25: write(13,*)"Reparticoes (N):", N*10
26: end program
27:
28: Subroutine int2DSimpson(x1,x2,S1)
29: real ss,x1,x2,h
30: external h
31: call simpson(h,x1,x2,S1)
32: return
33: end
34:
35: Subroutine int2DTrapz(x1,x2,S2)
36: real ss,x1,x2,g
37: external g
38: call trapz(g,x1,x2,S2)
39: return
40: end
41:
42: subroutine simpson(func, a, b, S1)
43: COMMON / NN / N
44: h = (b-a)/N
45: soma = func(a)
46: fator = 2
47: do i = 1, N-1
48:     if (fator == 2.) then
49:         fator = 4
50:     else
51:         fator = 2
52:     end if
53:     x = a+i*h
54:     soma = soma + fator*func(x)
55: enddo
56: soma = soma + func(b)
57: S1 = soma * h/3
58: end
59:
60: Subroutine trapz(func,a,b,S2)
61: Real SS, func, soma
62: COMMON/NN/N
63: External func
64: h = (b-a)/(N*10)
65: soma = 0.0
66: do i = 1, (N*10)-1
67: soma = soma + func(a+i*h)
68: enddo
69: S2 = h/2.0 * (func(a) + 2.0*soma + func(b))
70: return
71: end
72:
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 73: real function y1(x)
 74: COMMON/xm/xmax
 75: real x
 76: y1 = 0
 77: end
 78:
 79: real function y2(x)
 80: COMMON/xm/xmax
 81: real x
 82: y2 = sqrt(4-x**2)/2.0
 83: end
 84:
 85: function h(xx)
 86: real h, xx, f, y1, y2, s1
 87: external f
 88: COMMON/xrange/xmin,xmax
 89: COMMON/xyz/x,y,z
 90: x = xx
 91: call simpson(f, y1(x), y2(x), s1)
 92: h = s1
 93: return
 94: end
 95:
 96: function g(xx)
 97: real g, xx, f, y1, y2, s2
 98: external f
 99: COMMON/xrange/xmin,xmax
100: COMMON/xyz/x,y,z
101: x = xx
102: call trapz(f, y1(x), y2(x), s2)
103: g = s2
104: return
105: end
106:
107: function f(yy)
108: real f, yy, x, y
109: COMMON/xyz/x,y,z
110: y = yy
111: f = func(x,y)
112: return
113: end
114:
115: real function func(x,y)
116: real x,y
117: func = x**2 + 4*y**2
118: return
119: end
```