數值方法 hw3

C.2

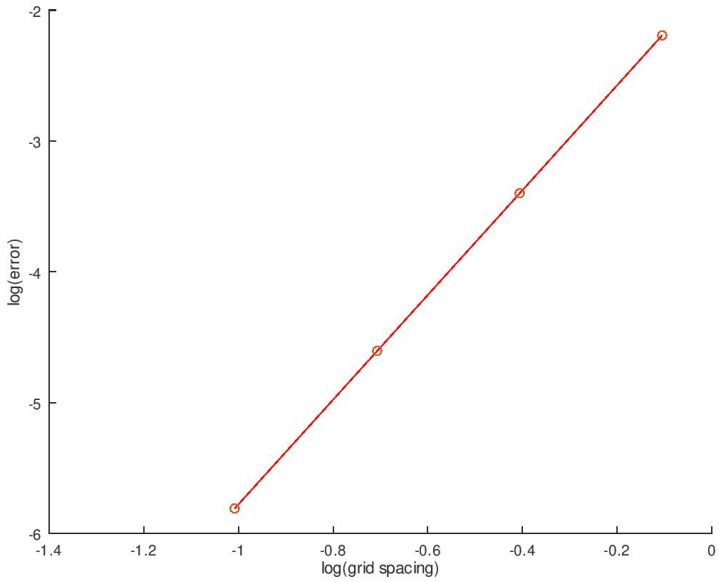
```
h1=linspace(0, pi, 4+1)
h2=linspace(0, pi, 8+1)
h3=linspace(0, pi, 16+1)
h4=linspace(0, pi, 32+1)
g1=g2=g3=g4=0;

for i=1:2:3
  a = (pi/4)^3/24 * sin(h1(i))
  b = (pi/4)^3/12 * sin(h1(i+1))
  c = (pi/4)^3/24 * sin(h1(i+2))
  d = 1/2 * (pi/4) * (sin(h1(i)) + 2*sin(h1(i+1)) + sin(h1(i+2)))
  g1 = g1 + a + b + c + d
endfor
for i=1:2:7
  a = (pi/8)^3/24 * sin(h2(i))
  b = (pi/8)^3/12 * sin(h2(i+1))
  c = (pi/8)^3/24 * sin(h2(i+2))
  d = 1/2 * (pi/8) * (sin(h2(i)) + 2*sin(h2(i+1)) + sin(h2(i+2)))
  g2=g2 + a + b + c + d
endfor
for i=1:2:15
  a = (pi/16)^3/24 * sin(h3(i))
  b = (pi/16)^3/12 * sin(h3(i+1))
  c = (pi/16)^3/24 * sin(h3(i+2))
  d = 1/2 * (pi/16) * (sin(h3(i)) + 2*sin(h3(i+1)) + sin(h3(i+2)))
  g3=g3 + a + b + c + d
endfor
for i=1:2:31
  a = (pi/32)^3/24*sin(h4(i))
  b = (pi/32)^3/12*sin(h4(i+1))
  c = (pi/32)^3/24*sin(h4(i+2))
  d = 1/2 * (pi/32) * (sin(h4(i)) + 2*sin(h4(i+1)) + sin(h4(i+2)))
  g4=g4 + a + b + c + d
endfor

ans1 = abs(g1-2)
ans2 = abs(g2-2)
ans3 = abs(g2-2)
ans4 = abs(g2-2)
```

```
error1=log10(abs(g1-2))
error2=log10(abs(g2-2))
error3=log10(abs(g3-2))
error4=log10(abs(g4-2))

x=[pi/4 pi/8 pi/16 pi/32];
y=[error1 error2 error3 error4];

hold on
plot(log10(x),y,'-r')
plot(log10(x),y,"o")
hold off
xlabel("log(grid spacing)")
ylabel("log(error)")
print("-djpeg",["C2",'.jpg'])
```

result

		ans = abs(g-f)		error = log10(ans)	
g1	1.9936	ans1	0.0064126	error1	-2.1930
g2	1.9996	ans2	0.00039745	error2	-3.4007
g3	2.0000	ans3	0.000024789	error3	-4.6057
g4	2.0000	ans4	0.0000015485	error4	-5.8101

log-log plot



E.1

```
x=1:7/8:8

function f = f(x)
  f = log(x)./x
endfunction

a = f(x(1))
b = f(x(9))
c = 2*(f(x(3))+f(x(5))+f(x(7)))
d = 4*(f(x(2))+f(x(4))+f(x(6))+f(x(8)))

ans = 7 / 8 / 3 * (a + b + c + d)
error = abs(2.1620386 - ans)
```

result

the value of the numerical integral =

ans	2.1486

the absolute value of the error =

error	0.013454

E.2

```
[x,w]=gauss_leg(1,8,9)
for i=1:9
  y=y+w(i).*log(x(i))./x(i);
endfor
z=abs(y-2.1620386);
```

result

w

	1
1	0.28446
2	0.63227
3	0.91214
4	1.0932
5	0.28446
6	0.63227
7	0.91214
8	1.0932
9	1.1558

x

	1
1	1.1114
2	1.5739
3	2.3532
4	3.3651
5	7.8886
6	7.4261
7	6.6468
8	5.6349
9	4.5

tags: 数値方法