ECON 512
Homework 4

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Question 1

```
clear;
close all;
Num=1e5;
[n, w] = qnwequi(Num, [0 0], [1, 1], 'N');
Sum0=n(:,1).^2+n(:,2).^2;
Pie=4/Num*sum(Sum0(:,1)<=1)
Pie =
3.1414
```

Question 2

```
clear;
close all;
Num=1e5;
[n, w] = qnwequi(Num, [0 0], [1, 1], 'N');
Pie(:)=Int_simp(@(x) 4*((n(:,1).^2+x.^2)<=1), 0, 1, 1000);
sum(Pie)/Num
ans =
3.1417
```

Question 3

```
clear;
close all;
Num=1e3;
[n, w] = qnwequi(Num, [0 0], [1, 1], 'N');
Pie=4/Num*sum(sqrt(1-n(:,1).^2))
Pie =3.1442
```

Question 4

```
clear;
close all;
Pie=Int_simp(@(x) 4*sqrt(1-x.^2), 0, 1, 1000)
Pie =
3.1416
```

Question 5

```
clear;
close all;
seed = 8673310;
rng(seed);
data1=rand(100,2,200);
data2=rand(1000,2,200);
data3=rand(10000,2,200);
Err1=0;
Err2=0;
Err3=0;
Pie1=zeros(200,1);
Pie2=zeros(200,1);
Pie3=zeros(200,1);
for i=1:200
sum1=data1(:,1,i).^2+data1(:,2,i).^2;
Pie1(i,1)=4/100*sum(sum1(:,1)<=1);
Err1=Err1+(Pie1(i,1)-pi)^2/200;
sum2=data2(:,1,i).^2+data2(:,2,i).^2;
Pie2(i,1)=4/1000*sum(sum2(:,1)<=1);
Err2=Err2+(Pie2(i,1)-pi)^2/200;
sum3=data3(:,1,i).^2+data3(:,2,i).^2;
Pie3(i,1)=4/10000*sum(sum3(:,1)<=1);
Err3=Err3+(Pie3(i,1)-pi)^2/200;
end
Err1
Err2
Err3
```

```
Num=[100,1000,10000];
Err11=zeros(3,1);
Err21=zeros(3,1);
for i=1:3
[n, w] = qnwequi(Num(i), [0 0], [1, 1], 'N');
Pie11=4/Num(i)*sum(sqrt(1-n(:,1).^2));
Err11(i,1)=(Pie11-pi)^2;
Pie21=Int_simp(@(x) 4*sqrt(1-x.^2), 0, 1, Num(i));
Err21(i,1)=(Pie21-pi)^2;
end
Err11
Err21

Err1 =
0.0319
Err2 =
0.0027
Err3 =
2.9103e-04
Err11 =
1.0e-03 *

0.4457
0.0070
0.0001

Err21 =
1.0e-06 *

0.2111
0.0002
0.0000
```

# of draws	100	1000	10000
pseudo-MC	0.0319	0.0027	2.9103e-04
quasi-MC	4.457e-04	6.9591e-06	1.4382e-07
Newton-Coates	2.111e-07	2.1093e-10	2.1091e-13