HW 4

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Question 1-Question 4: See the code down below.

Questions 5: Here I just compare different methods using the Pythagorean formula, and number of simulations is fixed at 200.

	Pseudo-MC	**quasi-MC**	**Newton-Coates**
n=100	0.0158	2.1636E-04	1.3821E-08
n=1000	1.6587E-04	1.7592E-07	1.3828E-12
n=10000	1.8807E-06	2.2415E-11	1.38293E-16

Code:

```
%HW 4
addpath('/study/project/ECON512EmpMethods/HW4/CEtools');
%% Question 1
clear;
n=10000; %number of draws
[h, w] = qnwequi(n, [0 0], [1, 1], 'N');
test=h(:,1).^2 + h(:,2) .^ 2 <= 1;
pie=4*sum(test)/n;

%% Question 2
clear;
n=10000;
x=0:1/n:1; y=0:1/n:1; z=4*dart(x,y);
%use equal weights
w=2*ones(length(x),1);w(1)=1;w(end)=1;w=w*(1/(2*n));
pie=w'*z*w;

%% Question 3
clear;
n=10000; %number of draws
[h, w] = qnwequi(n, 0, 1, 'N');
hh=sqrt(1-h.^2);
pie=4*sum(hh)/n;

%% Question 4
clear;
n=10000;
x=0:1/n:1; z=4*sqrt(1-x.^2);
%use equal weights
w=2*ones(length(x),1);w(1)=1;w(end)=1;w=w*(1/(2*n));
pie=z*w;

%% Question 5
clear;
max=200;
number=[100;1000;10000];

%quasi-MC
```

```
MSEQ=ones(3,1);
for i=1:3
   pieq=ones(max,1);
for s=1:max
   [h, w] = qnwequi(number(i), 0, 1, 'N');
   hh=sqrt(1-h.^2);
   pieq(s)=4*sum(hh)/number(i);
end
MSEQ(i)=sum((pieq-pi).^2)/number(i);
end

%NC
MSENC=ones(3,1);
for i=1:3
   pienc=ones(max,1);
   x=0:1/number(i):1; z=4*sqrt(1-x.^2);
   w=2*ones(length(x),1);w(1)=1;w(end)=1;w=w*(1/(2*number(i)));
   pienc=z*w;
MSENC(i)=sum((pienc-pi).^2)/number(i);
end

%pseudo-MC integration
MSEPC=ones(3,1);
seed = 1234567;
rng(seed);
for i=1:3
   piepc=ones(max,1);
for s=1:max
   h=rand(number(i),1);
   hh=sqrt(1-h.^2);
   piepc(s)=4*sum(hh)/number(i);
end
MSEPC(i)=sum((piepc-pi).^2)/number(i);
end
```