```
%small sample xs
%large sample xl

ns=5;
nl=1000;
nsim=1000;

%%Gaussian N(0,1)
%% Figure 1
mu=0;
sigma=1;
xsn=normrnd(0,1,ns,nsim);
xln=normrnd(0,1,nl,nsim);

figure
hold on
subplot(2,2,1)
histogram(mean(xsn),'Normalization','pdf')
hold on
title(['Sample mean- Small Sample, n=' num2str(ns)])
wx=[min(mean(xsn)):.1:max(mean(xsn))];
plot(wx,normpdf(wx,0,1/sqrt(ns)),'LineWidth',2,'Color','re
d')

subplot(2,2,2)
histogram(max(xsn),'Normalization','pdf')
title(['Sample max- Small Sample, n=' num2str(ns)])

subplot(2,2,3)
histogram(mean(xln),'Normalization','pdf')
title(['Sample mean- Large Sample, n=' num2str(nl)])
hold on
wx=[min(mean(xln)):.01:max(mean(xln))];
plot(wx,normpdf(wx,0,1/sqrt(nl)),'LineWidth',2,'Color','re
d')

subplot(2,2,4)
histogram(max(xln),'Normalization','pdf')
title(['Sample max- Large Sample, n=' num2str(nl)])


sgtitle('X \sim N(0,1)');
```

```
%%%Bernoulli(0.25)
%%%Figure 2
pi=0.25;
xsn=binornd(1,pi,ns,nsim);
xln=binornd(1,pi,nl,nsim);
figure
hold on
subplot(2,2,1)

[valori,~,idx] = unique(sum(xsn));          % unique
values
conteggi = accumarray(idx,1);        % assolute
frequencies

bar([conteggi/sum(conteggi) , binopdf(valori',ns,pi)])
set(gca,'XTickLabel',valori);
title(['Sample sum- Small Sample, n=' num2str(ns)])


subplot(2,2,2)
valori=[0,1]';
counts(1,1)=sum(min(xsn)==0);
counts(2,1)=sum(min(xsn)==1);


bar([counts/sum(counts) , binopdf(valori,1,pi^ns)])
set(gca,'XTickLabel',valori);
title(['Sample min- Small Sample, n=' num2str(ns)])

subplot(2,2,3)
histogram(sum(xln),'Normalization','pdf')
title(['Sample sum- Large Sample, n=' num2str(nl)])
hold on
wx=[min(sum(xln)):max(sum(xln))];
plot(wx,normpdf(wx,nl*pi,sqrt(nl*pi*(1-
pi))),'LineWidth',2,'Color','red')

subplot(2,2,4)
valori=[0,1]';
counts(1,1)=sum(min(xln)==0);
```

```
counts(2,1)=sum(min(xln)==1);


bar([counts/sum(counts) , binopdf(valori,1,pi^nl)])
set(gca,'XTickLabel',valori);
title(['Sample mean- Large Sample, n=' num2str(nl)])

sgtitle('X \sim Bernoulli(0.25)');


%%%Uniform(0,5)
theta=5;

xsn=unifrnd(0,theta,ns,nsim);
xln=unifrnd(0,theta,nl,nsim);

figure
hold on
subplot(2,2,1)
histogram(mean(xsn),'Normalization','pdf')

title(['Sample mean- Small Sample, n=' num2str(ns)])


subplot(2,2,2)
histogram(max(xsn),'Normalization','pdf')
title(['Sample max- Small Sample, n=' num2str(ns)])

hold on
wx=[0:.1:5];

plot(wx,(ns/theta).*((wx/theta).^(ns-
1)),'LineWidth',2,'Color','red')


subplot(2,2,3)
histogram(mean(xln),'Normalization','pdf')
title(['Sample mean- Large Sample, n=' num2str(nl)])
hold on
wx=[min(mean(xln)):.01:max(mean(xln))];
plot(wx,normpdf(wx,theta/2,theta/sqrt(12*nl)),'LineWidth',
2,'Color','red')
```

```
subplot(2,2,4)
histogram(max(xln),'Normalization','pdf')
title(['Sample max- Large Sample, n=' num2str(nl)])
hold on
wx=[min(max(xln))-.002:.001:5];


plot(wx,(nl/theta).*((wx/theta).^(nl-
1)),'LineWidth',2,'Color','red')



sgtitle('X \sim Uniform(0,5)');

%%%%Exponential(10)
lambda=10;;

xsn=exprnd(lambda,ns,nsim);
xln=exprnd(lambda,nl,nsim);

figure
hold on
subplot(2,2,1)
histogram(mean(xsn),'Normalization','pdf')

title(['Sample mean- Small Sample, n=' num2str(ns)])

hold on
wx=[0:.1:30];

plot(wx,gampdf(wx,ns,lambda/ns),'LineWidth',2,'Color','red
')


subplot(2,2,2)
histogram(min(xsn),'Normalization','pdf')
title(['Sample min- Small Sample, n=' num2str(ns)])

hold on
wx=[0:.1:max(min(xsn))];
```

```
plot(wx,exppdf(wx,lambda/ns),'LineWidth',2,'Color','red')


subplot(2,2,3)
histogram(mean(xln),'Normalization','pdf')
title(['Sample mean- Large Sample, n=' num2str(nl)])
hold on
wx=[min(mean(xln)):.1:max(mean(xln))];
plot(wx,normpdf(wx,lambda,lambda/sqrt(nl)),'LineWidth',2,'
Color','red')

subplot(2,2,4)
histogram(min(xln),'Normalization','pdf')
title(['Sample min- Large Sample, n=' num2str(nl)])


hold on
wx=[0:.001:max(min(xln))];

plot(wx,exppdf(wx,lambda/nl),'LineWidth',2,'Color','red')

sgtitle('X \sim Exponential(10)');
```