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Handwriting

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8.20 $n=72$ $\mu=\frac{1+2+3+4+5+6}{6}=3.5$

$\sigma=\frac{(1-3.5)^2+(2-3.5)^2+(3-3.5)^2+(4-3.5)^2+(5-3.5)^2+(6-3.5)^2}{6}=\frac{70}{4}\times\frac{1}{6}=\frac{35}{12}$

$\sigma_{\bar{x}}=0.2$

$P(3.6<\bar{X}<3.9)$

$=P(\frac{3.6-3.5}{0.2}<Z<\frac{3.9-3.5}{0.2})$

$=P(0.5<Z<2)=0.9772-0.6915$

$=0.2857$ #

8.34

$Z=\frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}}$

a) $P(\bar{X}_A-\bar{X}_B>4 \mid \mu_A=\mu_B)$ $\because Z=\frac{4-0}{\sqrt{\frac{5^2}{30}+\frac{5^2}{30}}}=\frac{4}{\sqrt{\frac{5}{3}}}\doteqdot 3.10$

$=P(Z>3.10)=0.001$

∵機率數過低

∴2個distribution重疊過少，2個distribution不相同

b) ∵B有誤∴支持A

8.48

$\mu=40$	$\bar{x}=42$
$s=6$	$n=24$

在 $-t_{0.025}$ ~ $t_{0.025}$ 之間

→ $-2.069<t<2.069$ (from table)

$t=\frac{\bar{x}-\mu}{\frac{s}{\sqrt{n}}}=\frac{42-40}{\frac{6}{\sqrt{24}}}\doteqdot 1.632$ ⟶ ∵ $-2.069<1.632<2.069$

∴合法

Matlab

Code

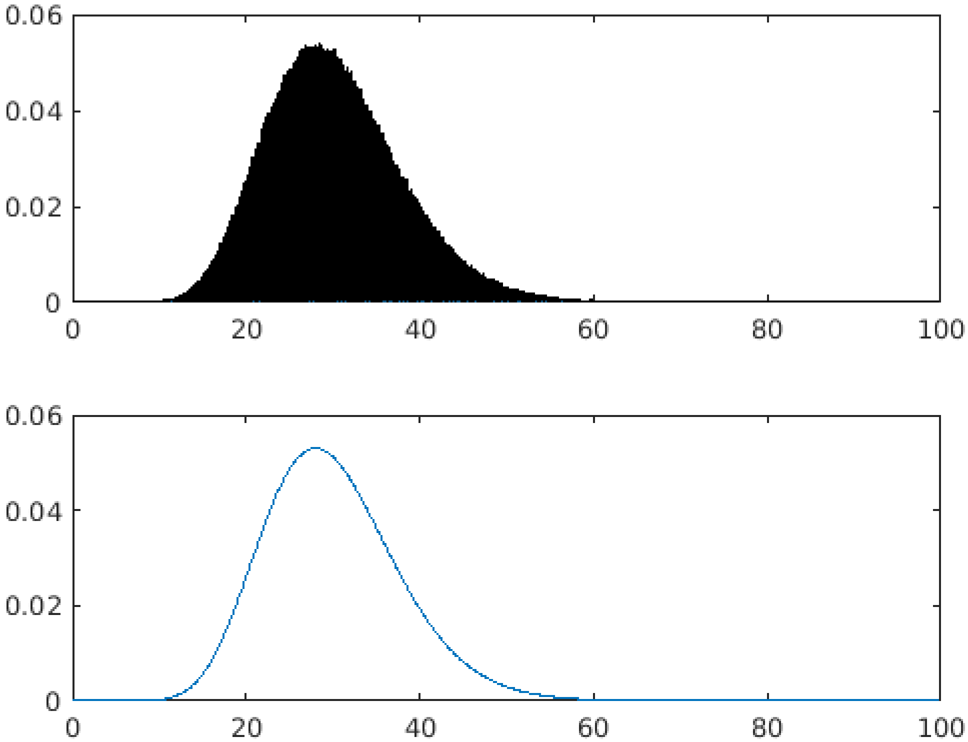
```
%% Problem 1
freedom=30;
bin_width=0.1;
sample_size=10^6;
xdata=0:bin_width:100;
ydata=RandSample(xdata,chi2pdf(xdata,freedom),bin_widt
h,sample_size);
figure(1);
hold on;
subplot(2,1,1);
histogram(ydata,'BinEdges',0-bin_width/2:bin_width:100-
bin_width/2,'Normalization','pdf');
subplot(2,1,2);
plot(xdata,chi2pdf(xdata,freedom));
hold off;
clear all;

%% Problem 2
% case 1
xdata=0:0.1:100;
sample_size=1;
bin_width=0.1;
for i=1:!0^6
temp1=RandSample(xdata,exppdf(xdata,10),bin_width,1);
ydata1(i)=mean(temp1);
end
for i=1:!0^6
temp2=RandSample(xdata,exppdf(xdata,10),bin_width,10);
ydata2(i)=mean(temp2);
end
for i=1:!0^6
temp3=RandSample(xdata,exppdf(xdata,10),bin_width,100
);
ydata3(i)=mean(temp3);
```

```
end

figure(2);
hold on;
subplot(2,2,1);
histogram(ydata1,'BinEdges',0-bin_width/2:bin_width:100-bin_width/2,'Normalization','pdf');
subplot(2,2,2);
histogram(ydata2,'BinEdges',0-bin_width/2:bin_width:100-bin_width/2,'Normalization','pdf');
subplot(2,2,3);
histogram(ydata3,'BinEdges',0-bin_width/2:bin_width:100-bin_width/2,'Normalization','pdf');
subplot(2,2,4);
plot(xdata,normpdf(xdata,10,10/100^0.5));
hold off;
clear all;
% case 2
bin_width=0.1;
xdata=0:0.1:100;
for i=1:!0^6
temp1=RandSample(xdata,normpdf(xdata,50,15),bin_width,1);
ydata1(i)=mean(temp1);
end
for i=1:!0^6
temp2=RandSample(xdata,normpdf(xdata,50,15),bin_width,10);
ydata2(i)=mean(temp2);
end
for i=1:!0^6
temp3=RandSample(xdata,normpdf(xdata,50,15),bin_width,100);
ydata3(i)=mean(temp3);
end

figure(3);
hold on;
subplot(2,2,1);
```

```
histogram(ydata1,'BinEdges',0-bin_width/2:bin_width:100-
bin_width/2,'Normalization','pdf');
subplot(2,2,2);
histogram(ydata2,'BinEdges',0-bin_width/2:bin_width:100-
bin_width/2,'Normalization','pdf');
subplot(2,2,3);
histogram(ydata3,'BinEdges',0-bin_width/2:bin_width:100-
bin_width/2,'Normalization','pdf');
subplot(2,2,4);
plot(xdata,normpdf(xdata,50,15/100^0.5));
hold off;
clear;

%% 3

figure(4);
bin_width=0.1;
xdata=0:0.1:200;
ydata=normpdf(xdata,50,15);

for i=1:!0^6
ydata1(i)=var(RandSample(xdata,ydata,0.1,5))*(5/225);
ydata2(i)=var(RandSample(xdata,ydata,0.1,10))*(10/225);
ydata3(i)=var(RandSample(xdata,ydata,0.1,100)*(100/225)
);
end

subplot(2,3,1);
histogram(ydata1,'BinEdges',0-bin_width/2:bin_width:100-
bin_width/2,'Normalization','pdf');
subplot(2,3,2);
histogram(ydata2,'BinEdges',0-bin_width/2:bin_width:100-
bin_width/2,'Normalization','pdf');
subplot(2,3,3);
histogram(ydata3,'BinEdges',0-bin_width/2:bin_width:100-
bin_width/2,'Normalization','pdf');

subplot(2,3,4);
ydata4=chi2pdf(xdata,4);
```

```
plot(xdata,ydata4);
subplot(2,3,5);
ydata5=chi2pdf(xdata,9);
plot(xdata,ydata5);
subplot(2,3,6);
ydata6=chi2pdf(xdata,99);
plot(xdata,ydata6);
hold off;
clear;
```

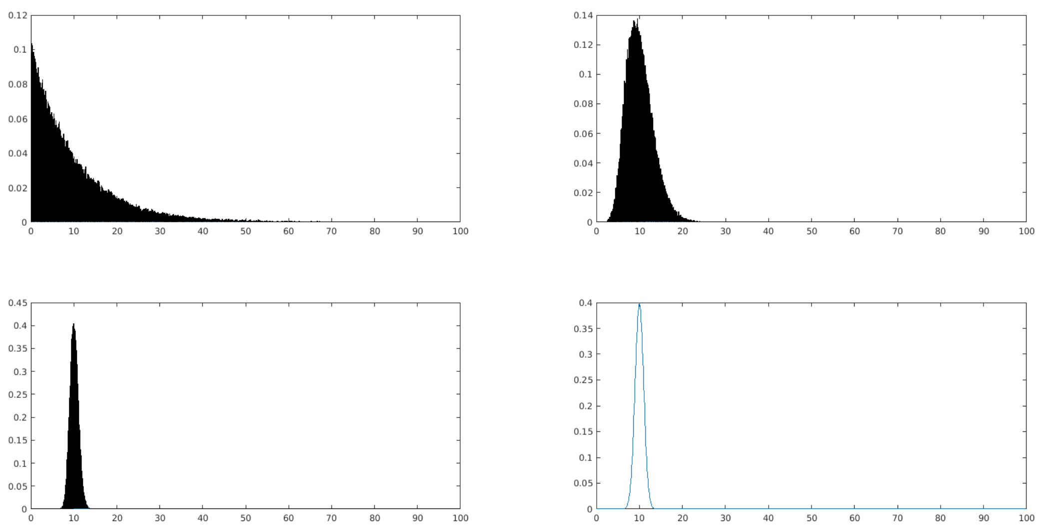
Problem 1



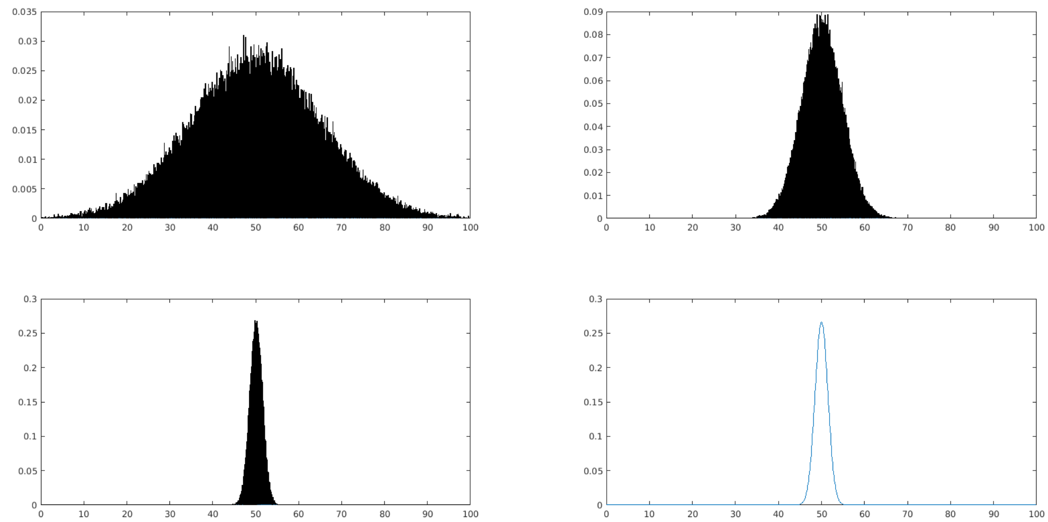
The upper plot is from sample. The sample size is 10^6.
The plot is reasonable since the sample is large enough so the answer is pretty close to the theoretical distribution(np and np is greater than 5).

Problem 2

Case 1:

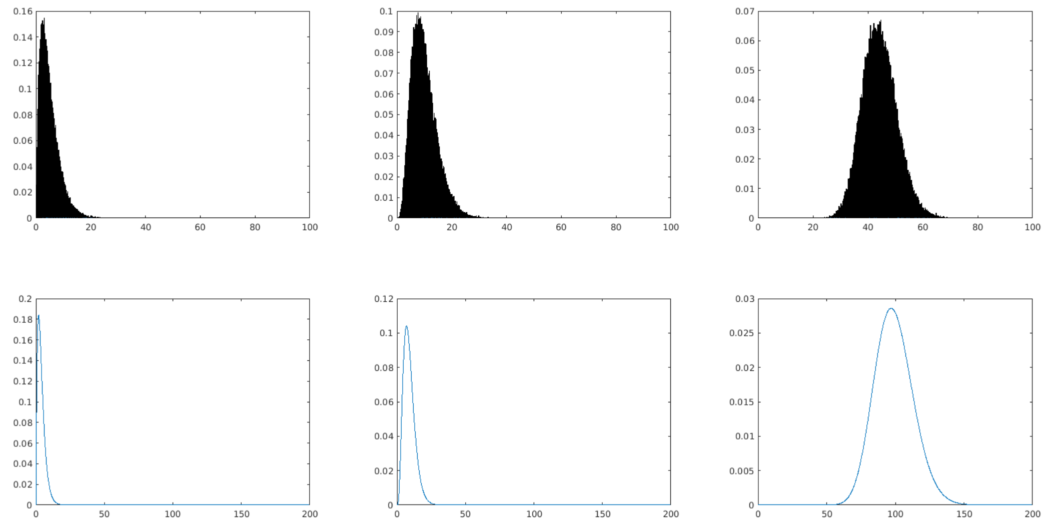


Case 2:



By Sample limit theory, if n become larger, the sample mean(S^2) will more likely be the normal distribution. Therefore from subplot 1-3 we can see difference by n=1,10,100.

Problem 3



By Sample limit theory, if n become larger, the sample mean(S^2) will more likely be the normal distribution. Therefore from subplot 1-3 we can see difference by n=5,10,100.