

# Problems Sheet 5

Statistics 2

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## Question 3

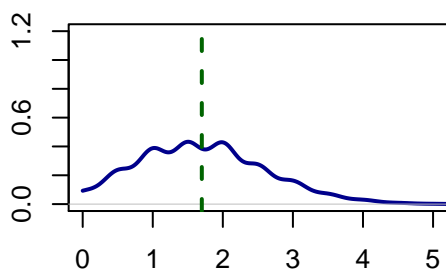
a)

Suppose  $\mathbf{X} \stackrel{\text{iid}}{\sim} \text{Poisson}(\theta)$

```
options(width=100,height=100)
par(mfrow=c(2,2))
N<-1000; theta<-1.7; ns=c(2,4,8,16)

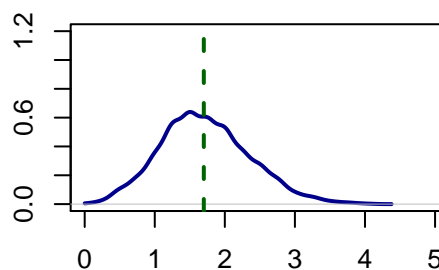
for (n in ns) {
  theta_hat<-sapply(1:N, function(i) mean(rpois(n=n,lambda=theta)))
  plot(density(theta_hat, from=0), xlim=c(0,5),ylim=c(0,1.2), main=paste("theta=",theta,"n=",n)
    ,xlab="Sampling Distirbution", ylab="", col="darkblue", lwd=2)
  abline(v=theta,col="darkgreen",lwd=2,lty=2)
}
```

**theta= 1.7 ,n= 2**



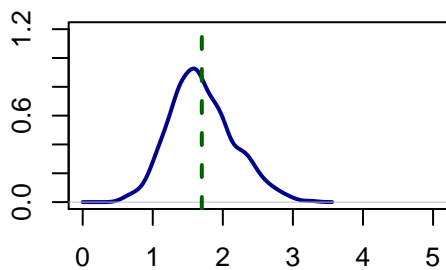
Sampling Distirbution

**theta= 1.7 ,n= 4**



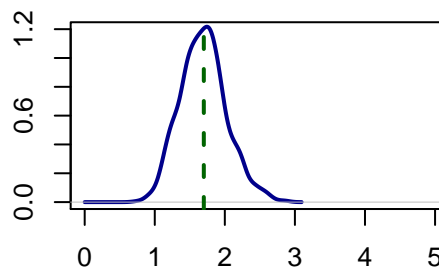
Sampling Distirbution

**theta= 1.7 ,n= 8**



Sampling Distirbution

**theta= 1.7 ,n= 16**



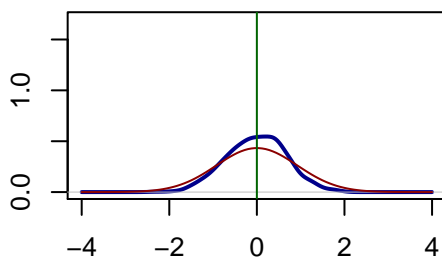
Sampling Distirbution

b)

```
par(mfrow=c(2,2))

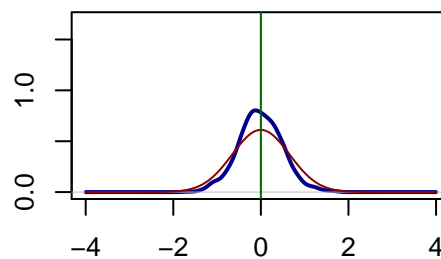
N<-1000;theta<-1.7;ns=c(2,4,8,16)
x<-seq(-4,4,length=100)
for (n in ns) {
  theta_hat<-sapply(1:N, function(i) mean(rnorm(n=n)))
  I=1/theta
  plot(density(theta_hat, from=-4,to=4), xlim=c(-4,4),ylim=c(0,1.7), main=paste("theta=",theta,",n=",n),
       ,xlab="Sampling Distirbution", ylab="", col="darkblue", lwd=2)
  lines(x,dnorm(x,sd=sqrt(1/(n*I))),type="l",col="darkred")
  abline(v=0,col="darkgreen")
}
```

**theta= 1.7 ,n= 2**



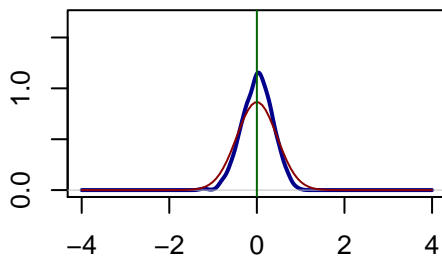
Sampling Distirbution

**theta= 1.7 ,n= 4**



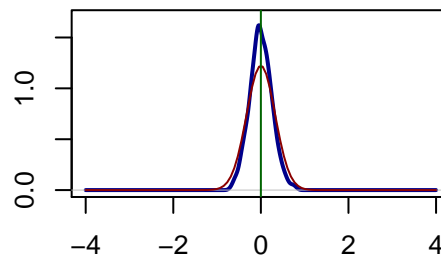
Sampling Distirbution

**theta= 1.7 ,n= 8**



Sampling Distirbution

**theta= 1.7 ,n= 16**



Sampling Distirbution