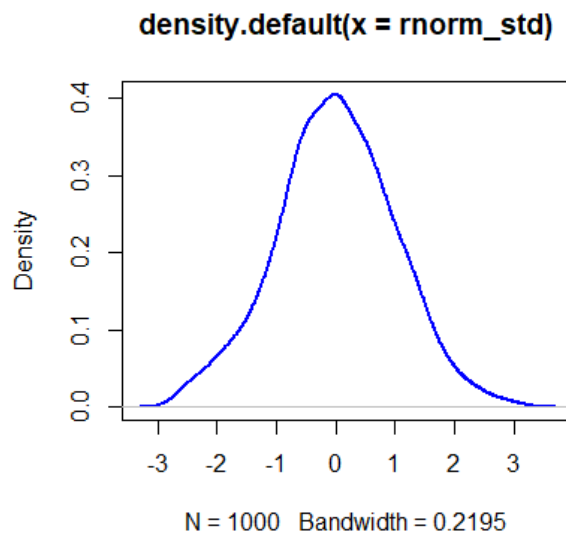


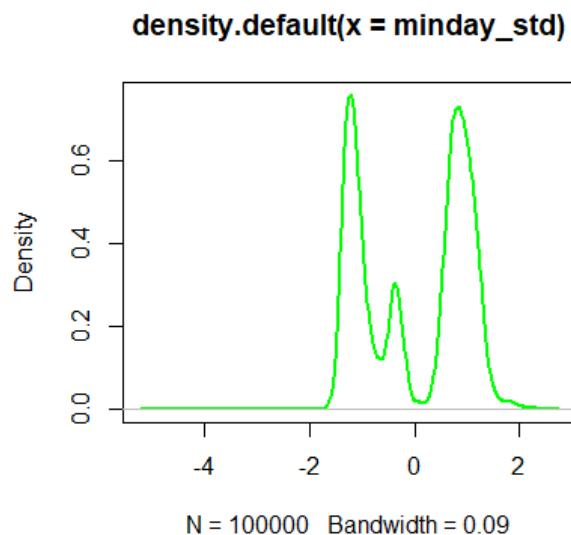
#1-a

```
> standardized<-function(numbers){  
+   numbers<-(numbers- mean(numbers))/sd(numbers)  
+   return (numbers)  
+ }  
> rnorm<-rnorm(n=1000,mean=940,sd=190)  
> rnorm_std<-standardized(rnorm)  
> plot(density(rnorm_std),col="blue",lwd=2)
```



> #1-b

```
> minday_std<-standardized(minday)  
> plot(density(minday_std), col="green", lwd=2)  
> mean(minday_std)  
[1] -4.25589e-17  
> sd(minday_std)  
[1] 1
```

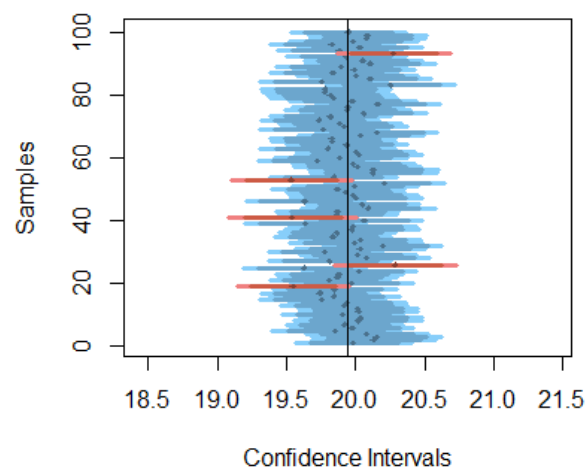


[illegible]

```

+ segment_colors <- list(c("lightcoral", "coral3", "coral4"),
+                         c("lightskyblue", "skyblue3", "skyblue4"))
+ color <- segment_colors[[as.integer(good)+1]]
+
+ segments(ci99_low, indices, ci99_high, indices, lwd=3, col=color[1])
+ segments(ci95_low, indices, ci95_high, indices, lwd=3, col=color[2])
+ points(sample_means, indices, pch=18, cex=0.6, col=color[3])
+ }

```

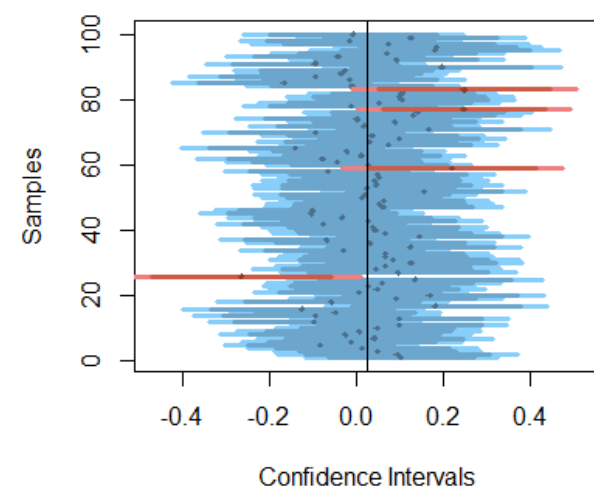


> #2-a

```

> visualize_sample_ci(num_samples = 100, sample_size = 100, pop_size=10000,
distr_func = rnorm)

```



> #2-a-i

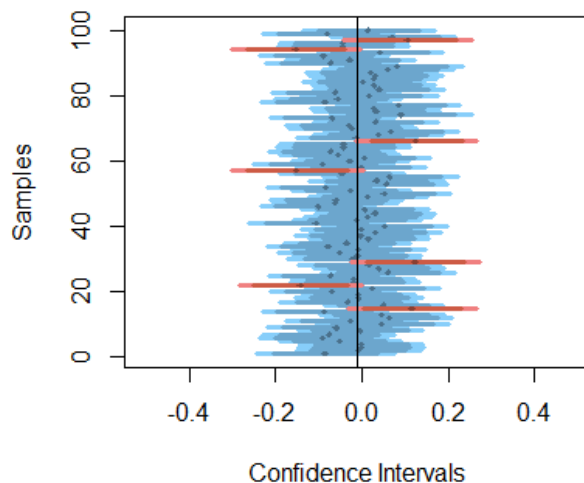
We expect 5% of sample not include in the population mean in its 95% CI, that is 5 of 100 will not be included in 95% CI.

> #2-a-ii

We expect 1% of sample not include in the population mean in its 99% CI, that is 1 of 100 will not be included in 95% CI.

> #2-b

> visualize_sample_ci(num_samples = 100, sample_size = 300,
pop_size=10000,distr_func = rnorm)



> #2-b-i

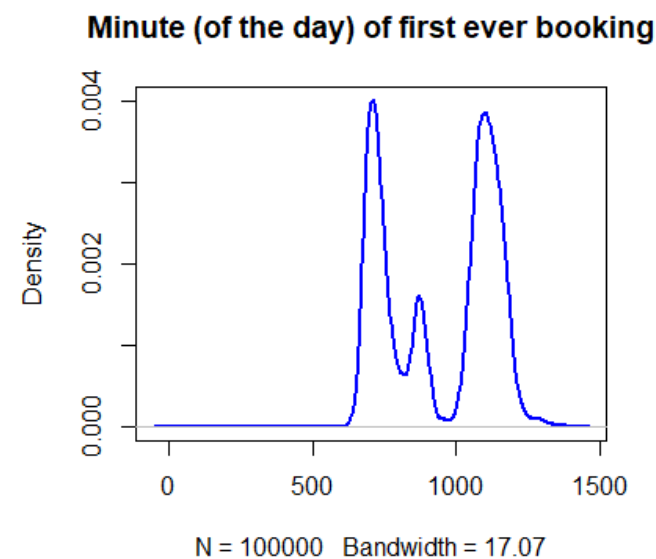
Since 95% (99%) CI equal to $(\text{sample mean} - 1.96(2.58) * \text{sample deviation} / \sqrt{\text{sample size}})$, $\text{sample mean} + 1.96(2.58) * \text{sample deviation} / \sqrt{\text{sample size}}$). From above, we can see that the width of CI is inversely proportional to sample size.

> #2-b-ii

We expect 5% of sample not include in the population mean in its 95% CI, that is 5 of 100 will not be included in 95% CI.

>#3-a-i

```
> bookings <- read.table("first_bookings_datetime_sample.txt", header=TRUE)
> bookings$datetime[1:9]
[1] "4/16/2014 17:30" "1/11/2014 20:00" "3/24/2013 12:00"
[4] "8/8/2013 12:00" "2/16/2013 18:00" "5/25/2014 15:00"
[7] "12/18/2013 19:00" "12/23/2012 12:00" "10/18/2013 20:00"
> hours <- as.POSIXlt(bookings$datetime, format="%m/%d/%Y %H:%M")$hour
> mins <- as.POSIXlt(bookings$datetime, format="%m/%d/%Y %H:%M")$min
> minday <- hours*60 + mins
> plot(density(minday), main="Minute (of the day) of first ever booking", col="blue",
lwd=2)
```



```
> mean(minday)
[1] 942.4964
> sd(minday)
[1] 189.6631
> interval<-mean(minday)+c(-1.96,1.96)*sd(minday)/sqrt(length(minday))
> interval
[1] 941.3208 943.6719
> #3-a-ii
> minday_size=300
> minday2=sample(minday,minday_size)
> minday_mean=mean(minday)
> resamples<-replicate(2000,sample(minday2 ,length(minday2), replace=TRUE))
> resamples
[1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10] [,11] [,12]
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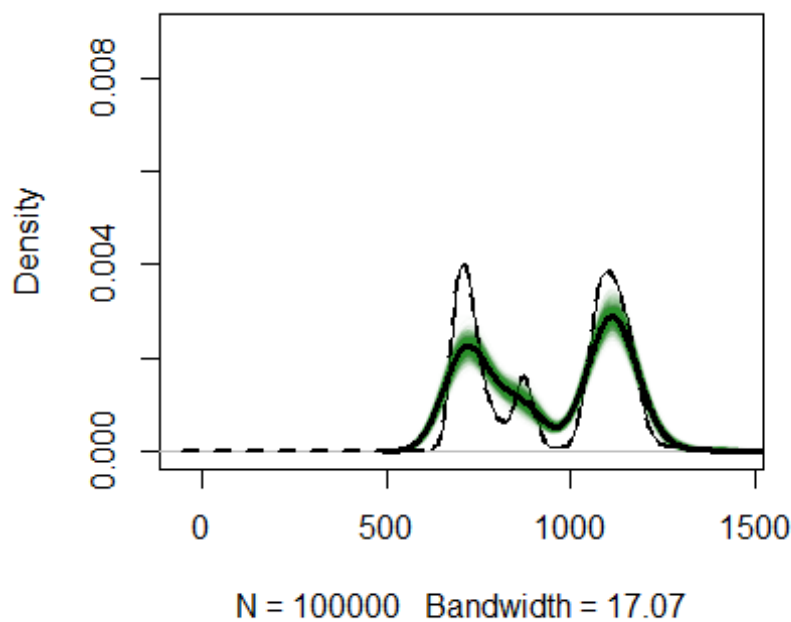
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population vs. bootstrapped samples



```
> #3-a-ii
> plot(density(minday),lwd=0,ylim=c(0, 0.009), main="population vs. bootstrapped
samples")
> plot_resample_density<-function(sample_i) {
+   lines(density(sample_i), col=rgb(0.0, 0.4, 0.0, 0.01))
+   return(mean(sample_i))
+ }
> sample_means<-apply(resamples, 2, FUN=plot_resample_density)
> lines(density(minday2),lwd=3)
> lines(density(minday),lwd=2,lty="dashed")
> #3-a-iv
> interval<-function(data){
+   return (c(mean(data)-1.96*sd(data),mean(data)+1.96*sd(data)))
+ }
> bootstrap_interval<-sapply(resamples,interval)
```

