L1M1Checkpoint

Checkpoint L1:

$$f_X(x|\alpha,\beta) = \frac{\beta^\alpha}{\Gamma(\alpha)} x_n^{\alpha-1} \cdot e^{-\beta x}$$

$$= \frac{\beta^\alpha}{\Gamma(\alpha)} x_1^{\alpha-1} e^{-\beta x_1} \cdot \frac{\beta^\alpha}{\Gamma(\alpha)} x_2^{\alpha-1} e^{-\beta x_2} \cdots \frac{\beta^\alpha}{\Gamma(\alpha)} x_n^{\alpha-1} e^{-\beta x_n}$$

$$\Rightarrow \left(\frac{\beta^\alpha}{\Gamma(\alpha)}\right)^n \cdot \left(\prod_{i=1}^{n} x_i\right)^{\alpha-1} \cdot e^{-\sum_{k=1}^{n} \beta x_k}$$

$$= \left(\frac{\beta^\alpha}{\Gamma(\alpha)}\right)^n \left(\prod_{i=1}^{n} x_i\right)^{\alpha-1} \cdot e^{-\beta n\bar{x}}$$

Figure 1: L1 Checkpoint

M1 Checkpoint:

Here, we will use $\beta = 4$ to produce the simulation.

```r
paretobar<-rep(0,1000)
for(i in 1:1000){u<-runif(225);
  pareto<-1/(1-u)^(1/4);
  paretobar[i]<-mean(pareto)}
betahat<-paretobar/(paretobar-1)
mean(betahat)
```

```
## [1] 4.017911
```

```r
sd(betahat)
```

```
## [1] 0.288513
```

We know $\beta = 4$ here

The mean of our Simulation is also ≈ 4

$$sd = \sqrt{\frac{\beta(\beta-1)^2}{n(\beta-2)}} = \sqrt{\frac{4(9)}{225(2)}} = 0.2828$$

We can see that this value of σ is also quite close to the value we found in our Simulation.

Figure 2: b4

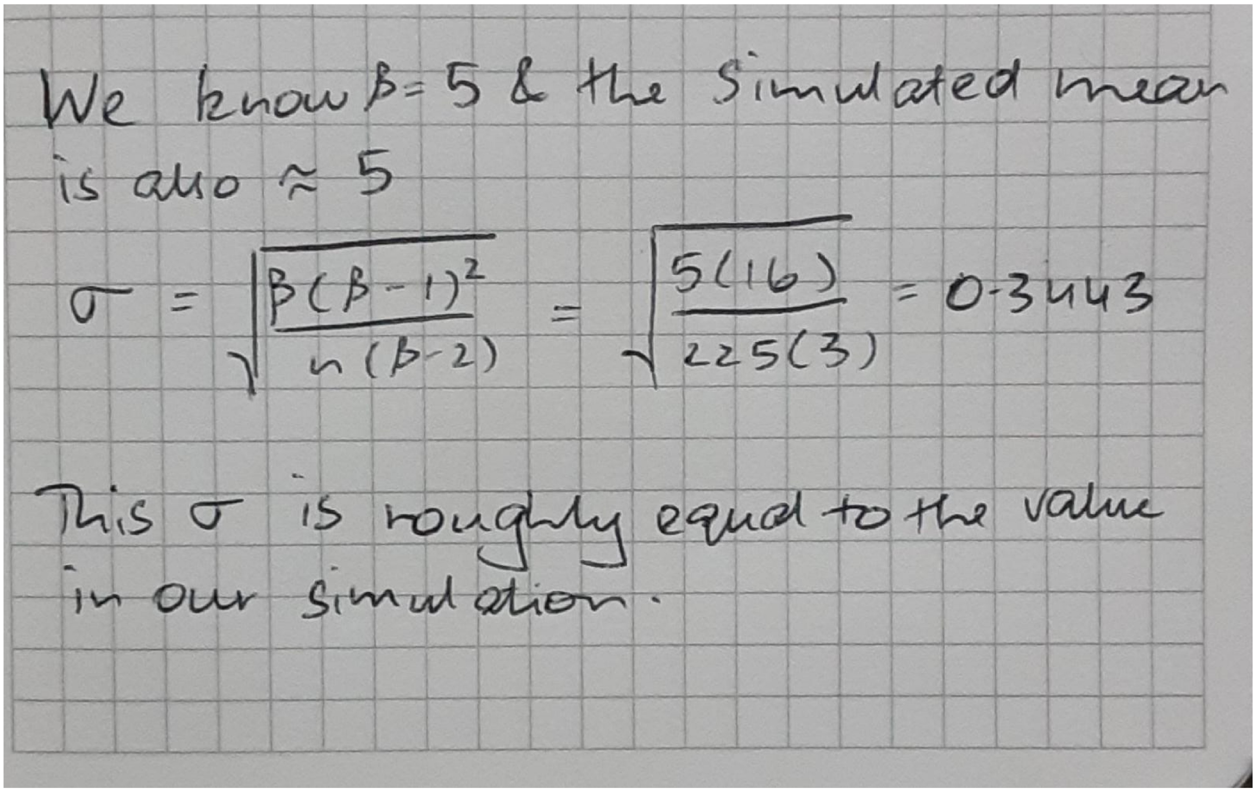
Here, we will use $\beta = 5$ to produce the simulation.

```r
paretobar<-rep(0,1000)
for(i in 1:1000){u<-runif(225);
  pareto<-1/(1-u)^(1/5);
  paretobar[i]<-mean(pareto)}
betahat<-paretobar/(paretobar-1)
mean(betahat)
```

```
## [1] 5.031454
```

```r
sd(betahat)
```

```
## [1] 0.3384557
```



We know $\beta = 5$ & the simulated mean is also ≈ 5

$$\sigma = \sqrt{\frac{\beta(\beta-1)^2}{n(\beta-2)}} = \sqrt{\frac{5(16)}{225(3)}} = 0.3443$$

This σ is roughly equal to the value in our simulation.

Figure 3: b5