Problem 10: X-ray Flares

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Question 1

Solution:

```
set.seed(105)
s <-  rweibull(6,5,1)
low_ci <- mean(s)-1.96*(sd(s)/sqrt(6))
up_ci <- mean(s)+1.96*(sd(s)/sqrt(6))
ci <- c(low_ci, up_ci)
ci

## [1] 0.6264403 1.0988755
```

The estimated value of S is 0.8626579 and provide a 95% frequentist confidence intervalis 0.6264403, 1.0988755.

Question 2

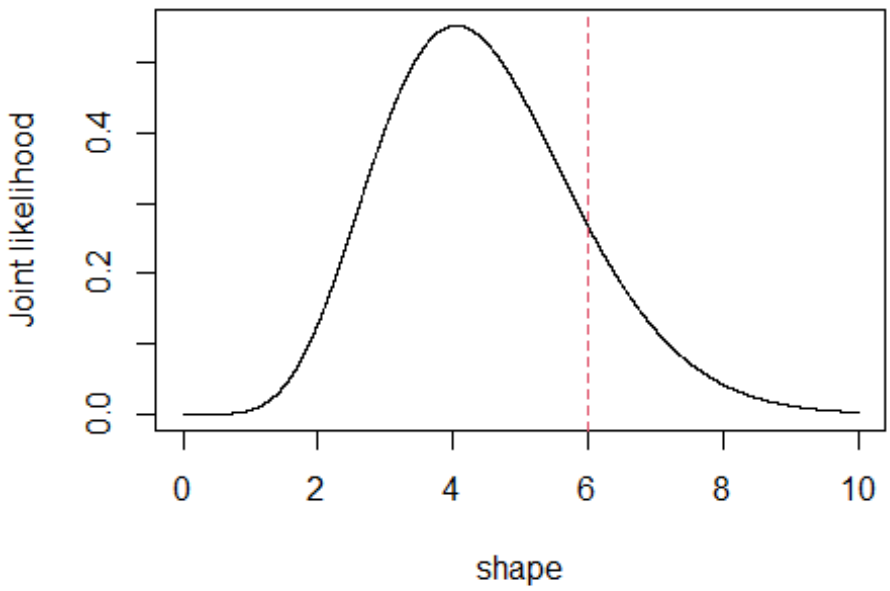
Solution:

the likelihood function L(S; n) for this scenario can be written as

$$L(S;n) = \prod nS^{n-1}\exp(-S^n)$$

.

```
x <- s
shape = seq(0.01,10,0.001)
jointL = rep(1.0, length(shape))
for (i in 1:length(x)) jointL = jointL * dweibull(x[i], shape, 1)
plot(shape, jointL, type='l', xlim=c(0,10), ylab='Joint likelihood')
abline(v=6, col =2, lty = 2)
```



Question 3

Solution:

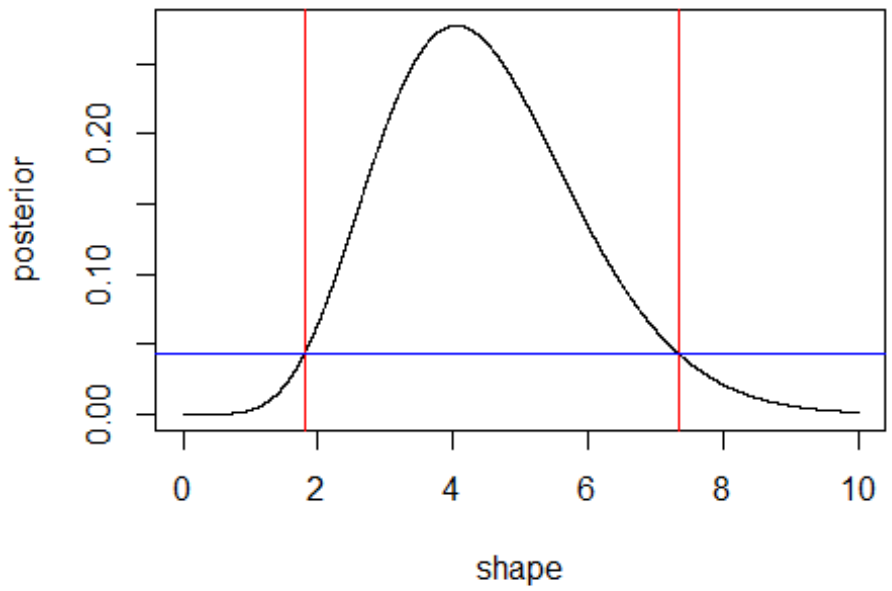
The the maximum-likelihood value of S is aproximately 0.25 when n=6.

Question 4

Solution:

```
posterior = jointL / sum(jointL*0.001)

for (P in seq(0.0,max(posterior),0.001)) {
probenclosed = sum(posterior[posterior > P]*0.001)
 if (probenclosed < 0.95) break
 }
CI = range(shape[posterior > P])
plot(shape, posterior, type='l', xlim=c(0,10))
abline(v=CI[1], col='red')
abline(v=CI[2], col='red')
abline(h=P, col='blue')
```



An approximate 95% credible interval on S is 1.798, 7.34.