Assignment 9

Ben Arancibia

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Problem Set 1

1) Function that will produce a sample of random variable that is distrubuted as follows:

$$f(x) = \begin{cases} x & \text{if } 0 \leq x \leq 1 \\ 2 - x & \text{if } 1 \leq x \leq 2 \end{cases}$$

```
function_one <- function(x) {
  if (x >= 0 && x <= 1) {
    return(x)
  } else if (x > 1 && x <= 2) {
    return(2-x)
  }
}
```

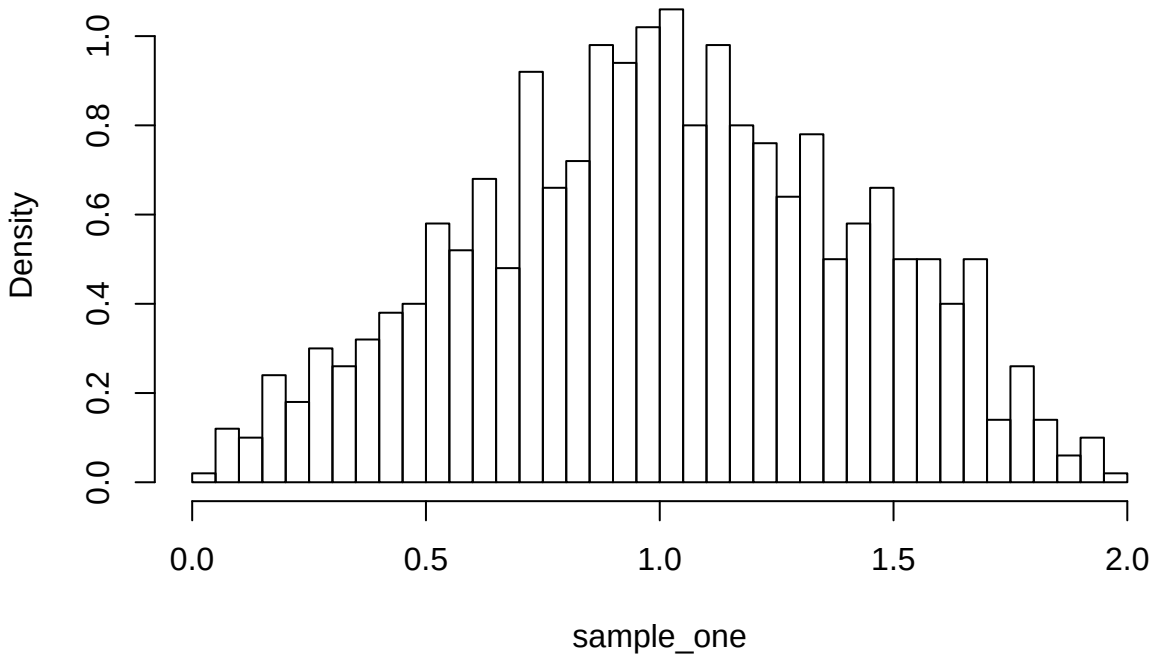
2) Function that will produce a sample of random variable that is distrubuted as follows:

$$f(x) = \begin{cases} 1 - x & \text{if } 0 \leq x \leq 1 \\ x - 1 & \text{if } 1 \leq x \leq 2 \end{cases}$$

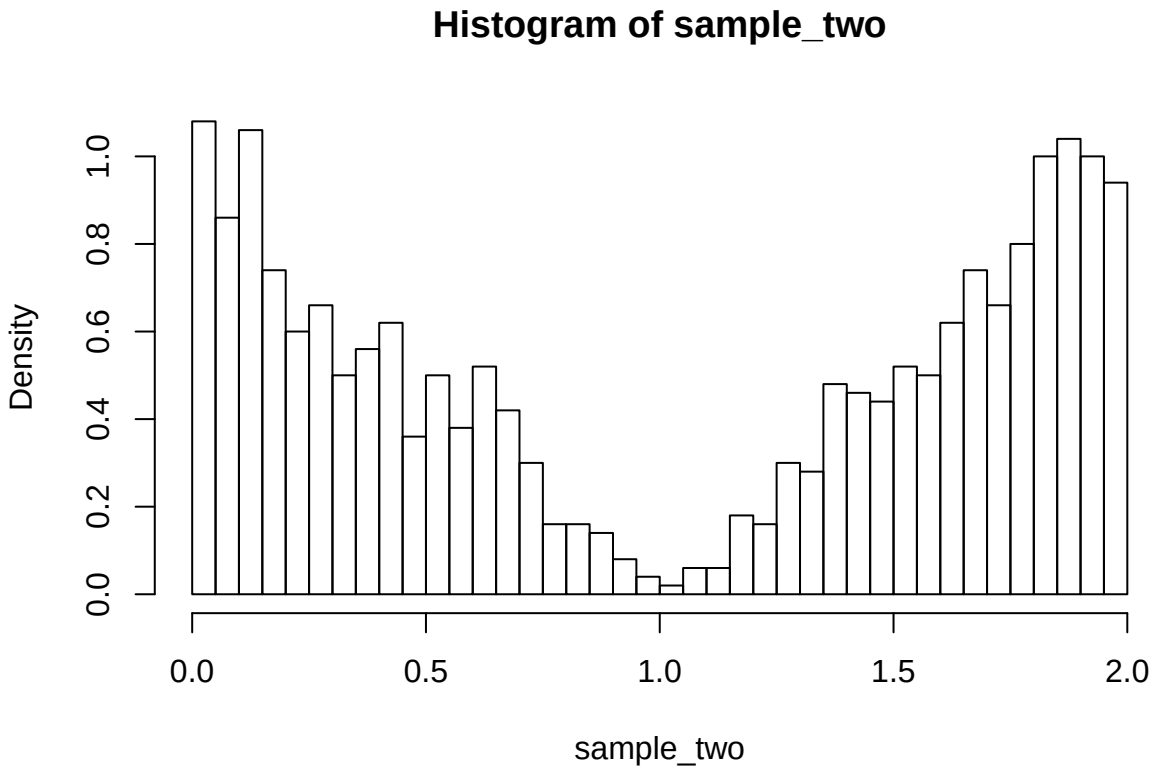
```
function_two <- function(x) {
  if (x >= 0 && x <= 1) {
    return(1-x)
  } else if (x > 1 && x <= 2) {
    return(x-1)
  }
}
```

3) 1000 samples using each pdf. Save one histogram for each PDF.

```
sample_one <- sample(
  seq(0,2, by=0.01), 1000, replace=T,
  prob=sapply(
    seq(0,2,by=0.01),
    function(x) function_one(x)
  )
)

hist(sample_one, 30, freq=F)
```

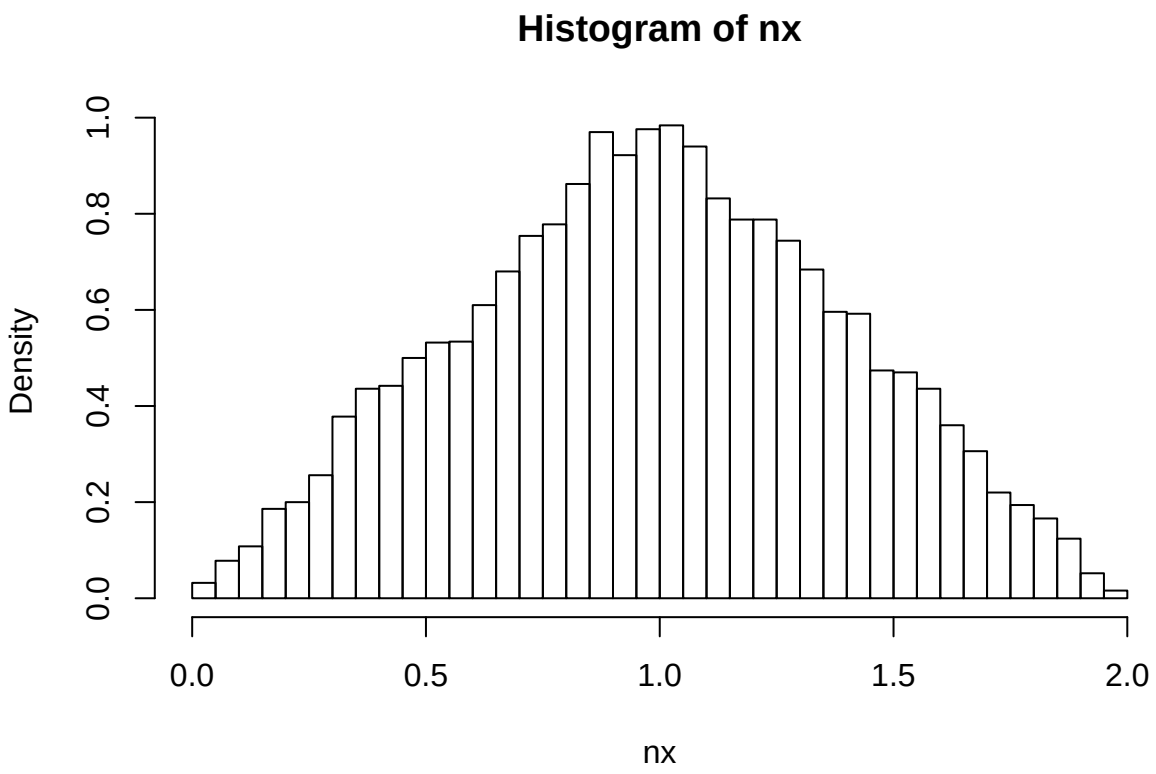



```
sample_two <- sample(
  seq(0,2, by=0.01), 1000, replace=T,
  prob=sapply(
    seq(0,2,by=0.01),
    function(x) function_two(x)
  )
)

hist(sample_two, 30, freq=F)
```



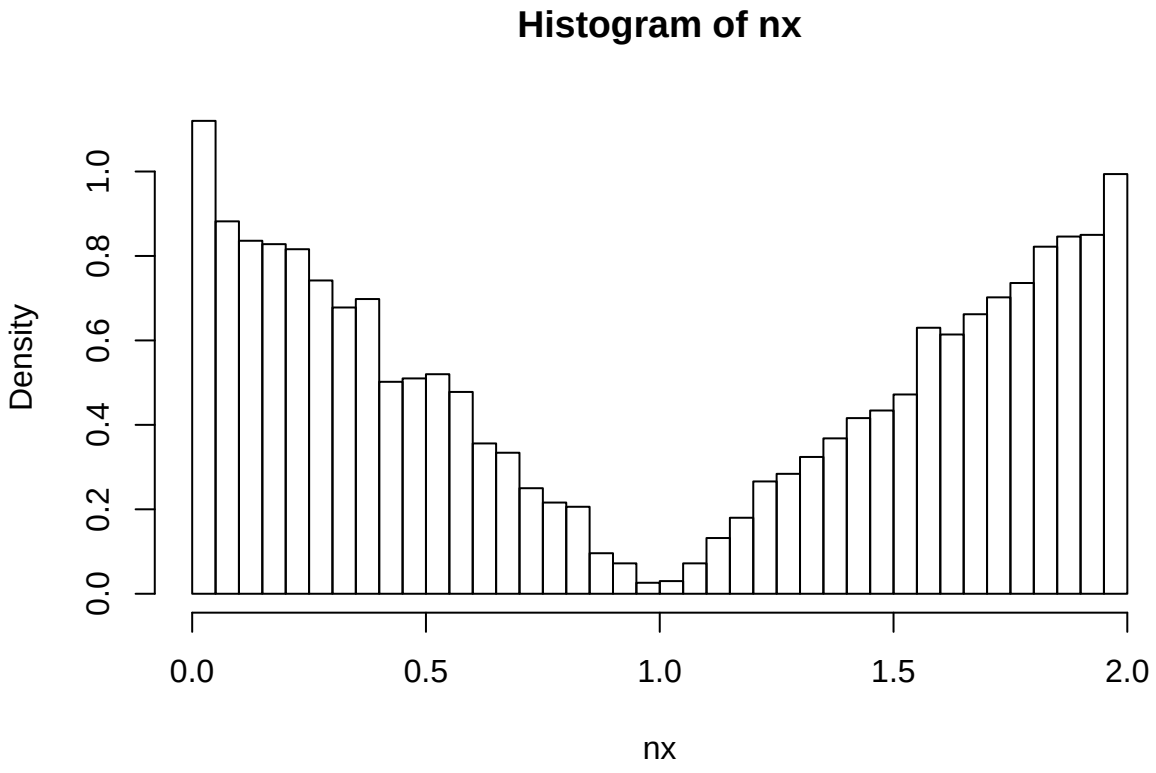
4) Size n as a parameter and the PDF as the second parameter, perform 1000 iterations. Plot a histogram.

```
problem_four <- function(n, pdf) {
  nx <- sample(seq(0,2, by=0.01), n, replace=T,
               prob = sapply(
                 seq(0,2,by=0.01),
                 function(x) {
                   pdf(x)}))
  hist(nx, 30, freq=F)
  print(paste("The sample mean for", n, "samples from the pdf is", mean(nx)))
}

problem_four(10000, function_one)
```




```
## [1] "The sample mean for 10000 samples from the pdf is 0.993814"
```

```
problem_four(10000, function_two)
```

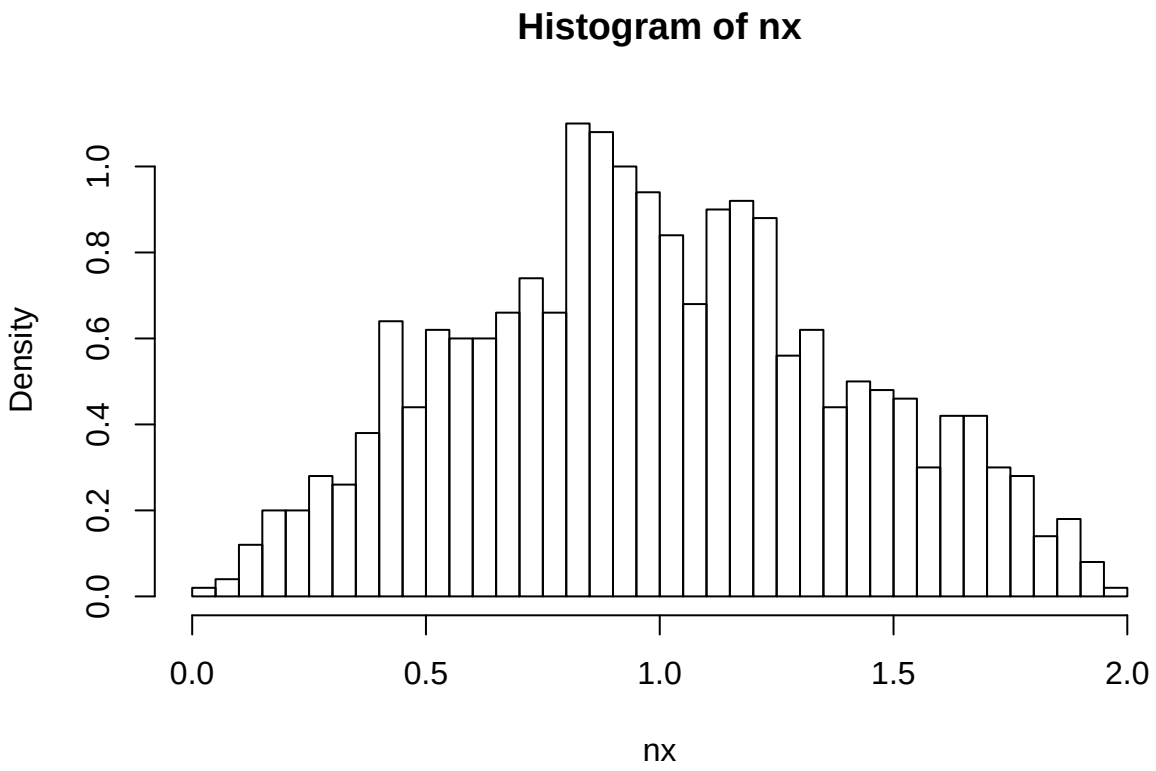



```
## [1] "The sample mean for 10000 samples from the pdf is 0.989921"
```

5) Use the PDFs with sample sizes of 10 and 20.

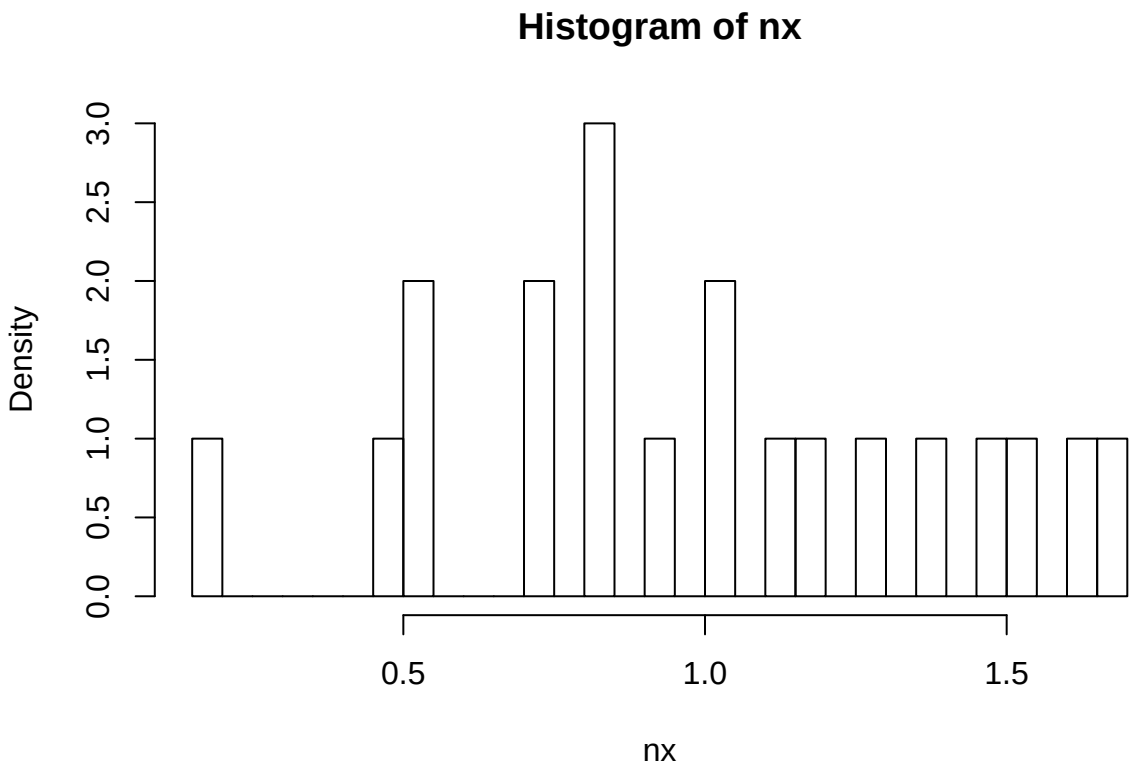
PDF 1

```
problem_four (1000, function_one)
```



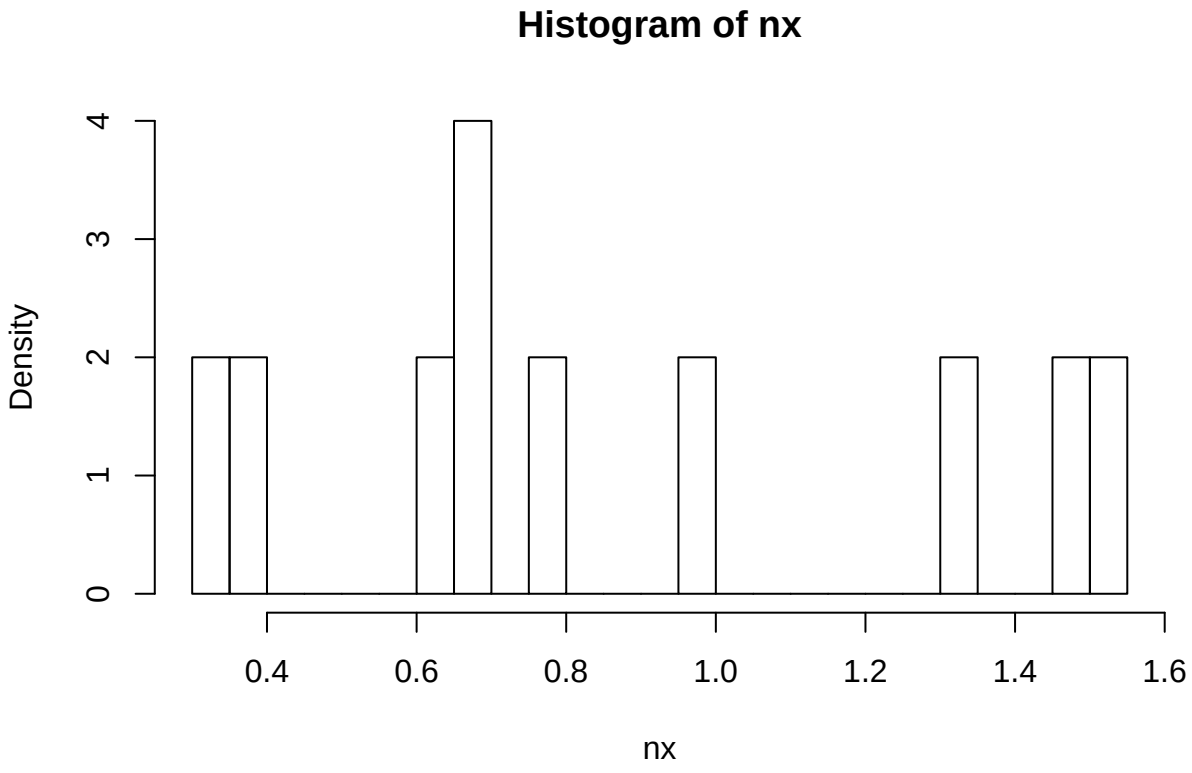

```
## [1] "The sample mean for 1000 samples from the pdf is 0.99585"
```

```
problem_four (20, function_one)
```




```
## [1] "The sample mean for 20 samples from the pdf is 0.9925"
```

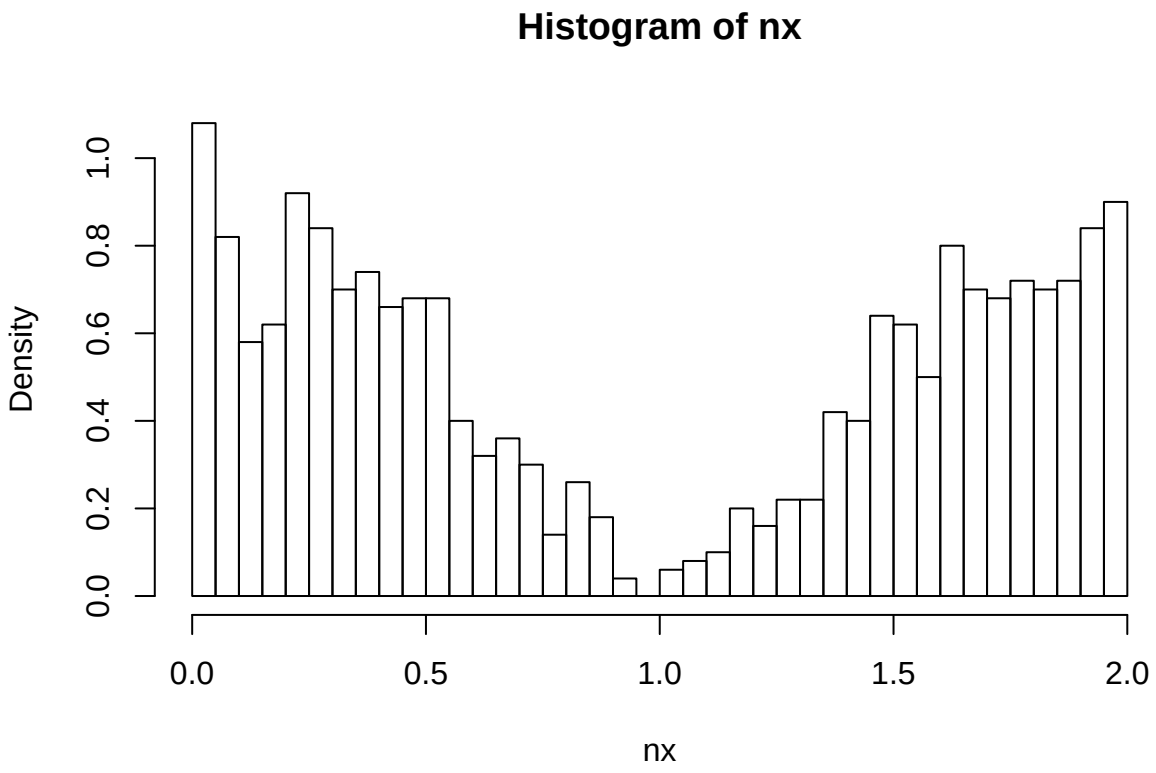
```
problem_four (10, function_one)
```




```
## [1] "The sample mean for 10 samples from the pdf is 0.876"
```

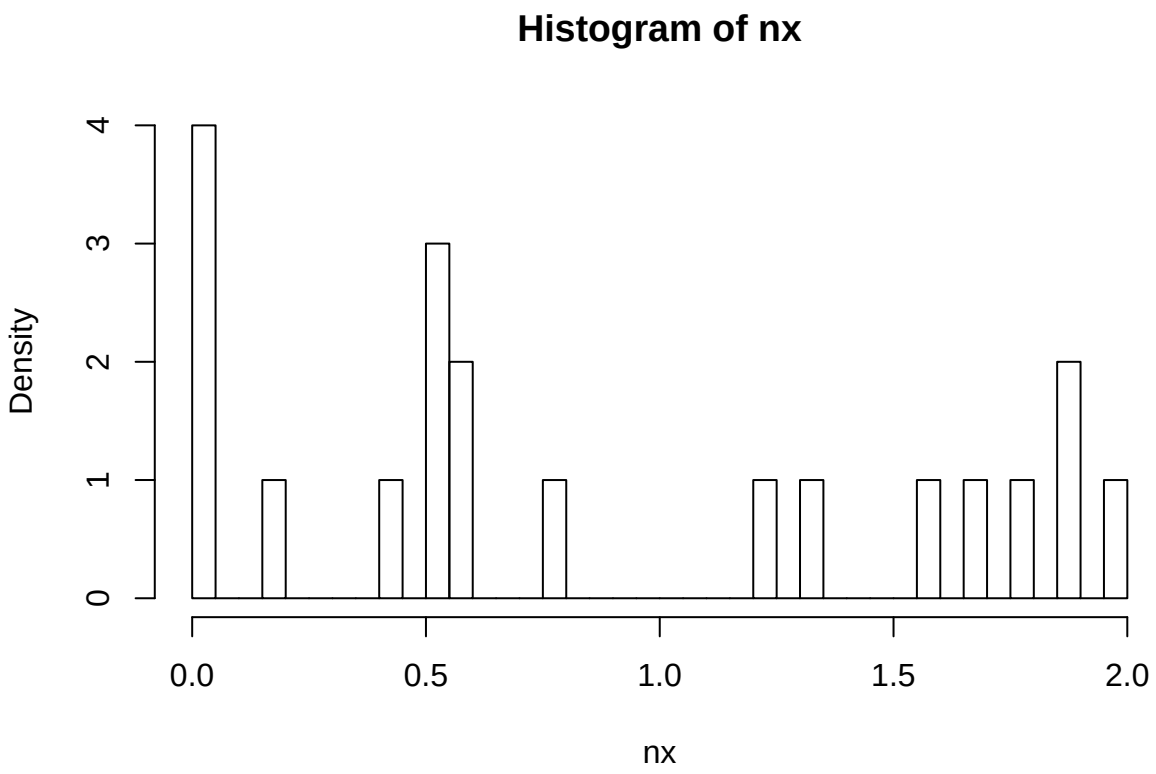
PDF 2

```
problem_four (1000, function_two)
```



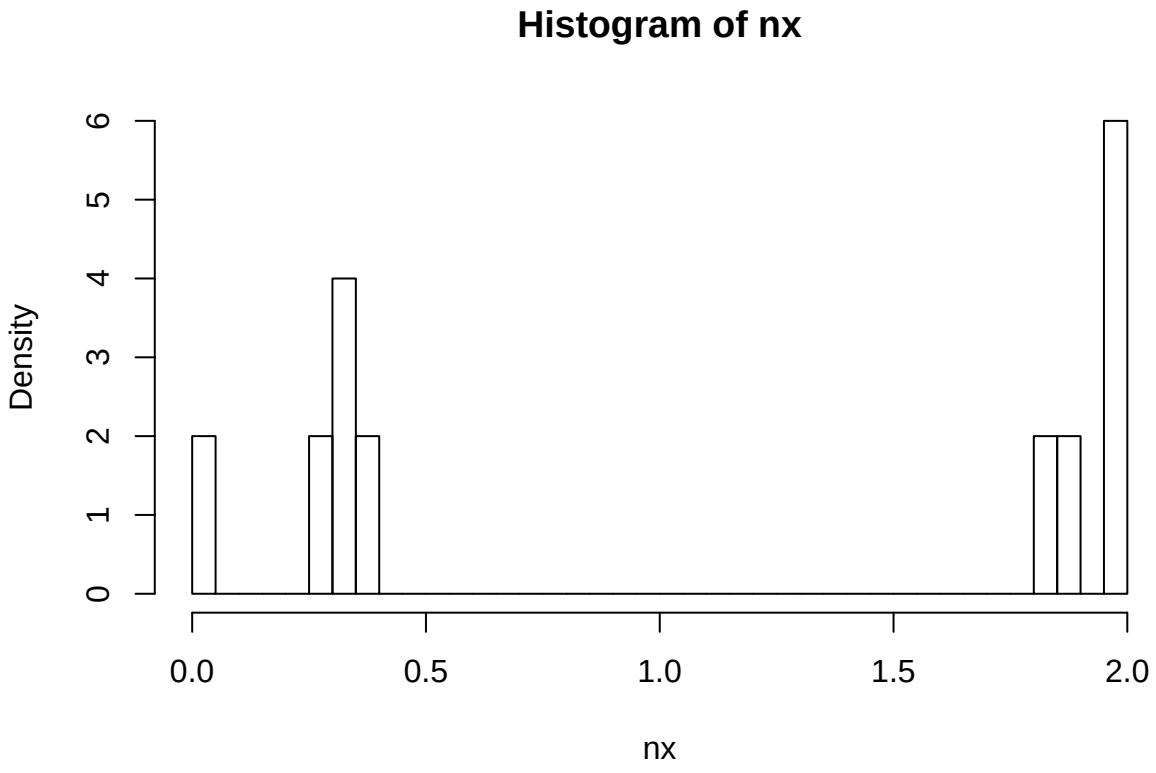

```
## [1] "The sample mean for 1000 samples from the pdf is 0.98558"
```

```
problem_four (20, function_two)
```




```
## [1] "The sample mean for 20 samples from the pdf is 0.8785"
```

```
problem_four (10, function_two)
```




```
## [1] "The sample mean for 10 samples from the pdf is 1.094"
```