3rd homework

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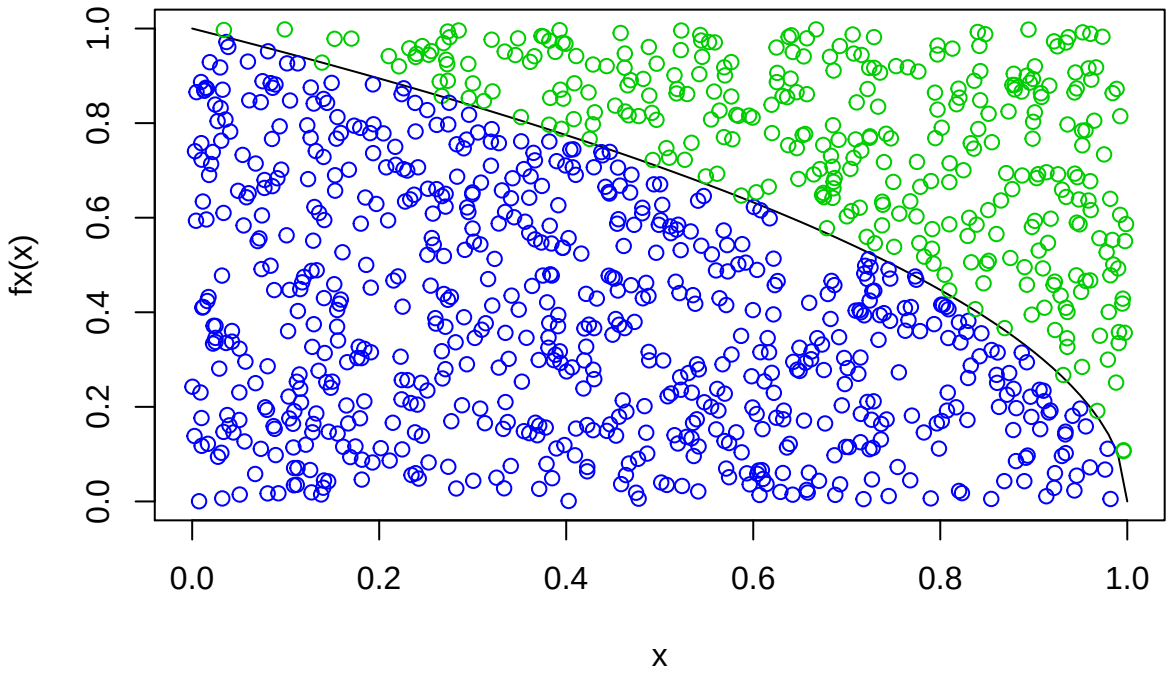
1. Find the value:

```
fx <- function(x) {sqrt(1-x)}
integrate(fx, lower = 0, upper = 1)
```

```
## 0.6666667 with absolute error < 7.7e-05
```

2. Hit and Miss:

```
curve(fx)
n <- 1000
x1 <- runif(n, 0, 1); y1 <- runif(n, 0, 1)
behind <- y1 <= {sqrt(1-x1)}
points(x1, y1, col = 3+behind)
```




```
mean(behind)
```

```
## [1] 0.671
```

```
var(behind)
```

```
## [1] 0.22098
```

3. $\phi \rightarrow f$:

```
x<-runif(1000)
mean(sqrt(1-x))
```

```
## [1] 0.6778274
```

4. Importance Sampling:

```
## I miss the weight function. Thus, I chose it by myself.

w <- function(x) dunif(x, 0, 1)/ dbeta(x, 0.7, 1)
f <- function(x) {sqrt(1-x)}
X <- rbeta(1000, 0.7, 1)
Y <- w(X)*f(X)
Y <- Y[!is.na(Y)]
mean(Y)
```

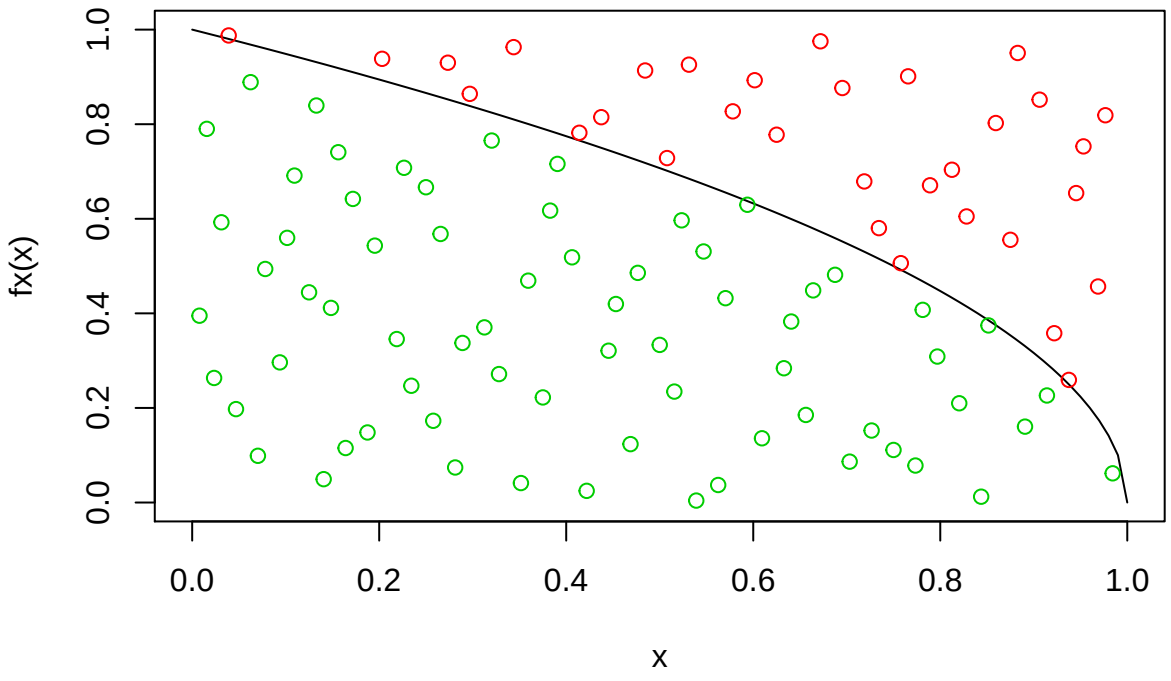
```
## [1] 0.669359
```

```
var(Y)
```

```
## [1] 0.03357888
```

5. Halton:

```
curve(fx)
a <- halton(100, dim = 2, usetime = F)
under <- a[,2] <= {sqrt(1 - a[, 1])}
points(a, col = 2+under)
```



```r
mean(under)
```

```
## [1] 0.68
```

```r
var(under)
```

```
## [1] 0.219798
```

Monte Carlo:

```r
nsim <- 10000
u <- runif(nsim)
sum(fx(u))/ nsim
```

```
## [1] 0.6715045
```