Assignment 2 - Ram Yoogesh (20867060)

(A)

$$G_W(y) = Pr(W \leq y)$$

$$H_W(y) = Pr(Q_X(F_X(a) + U \times (F_X(b) - F_X(a))) \leq y)$$

$$H_W(y) = Pr(F_X(Q_X(F_X(a) + U \times (F_X(b) - F_X(a)))) \leq F_X(y))$$

$$H_W(y) = Pr(F_X(a) + U \times (F_X(b) - F_X(a)) \leq F_X(y))$$

$$H_W(y) = Pr(U \leq \frac{F_X(y) - F_X(a)}{F_X(b) - F_X(a)})$$

$$H_W(y) = Pr(U \leq \frac{F_X(y) - F_X(a)}{F_X(b) - F_X(a)})$$

$$H_W(y) = Pr(U \leq G_Y(y))$$

Hence,

$$H_W(y) = G_Y(y)$$

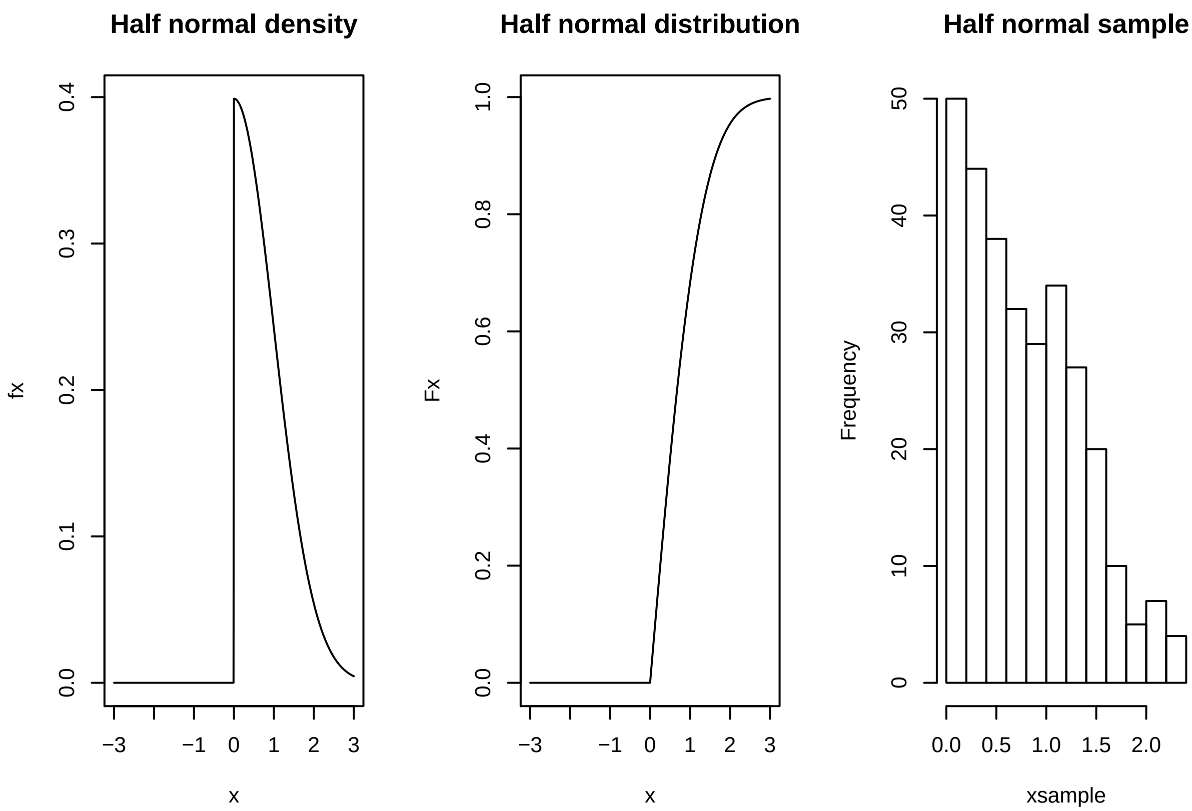
(B)

```
truncate <- function (ddist = dnorm, pdist = pnorm, qdist = qnorm, a = -Inf, b = Inf)
{


  # Writing the necessary code for Ddist
f1 <- function(value){
  emptvector <- c()

  for(i in value)
  {
    if (i < a || i > b)
    {
      emptvector <- c(emptvector, 0)
    }
```

```r
    else{
      probfun_val <- ddist(i)
      emptvector <- c(emptvector, probfun_val)
    }
  }
  return(emptvector)
}


# Writing the necessary code for Pdist
f2 <- function(value)
{
  emptf2_vector <- c()
  for(i in value)
  {
    if (i < a)
    {
      emptf2_vector <- c(emptf2_vector, 0)
    }
    else if (i > b)
      {
      emptf2_vector <- c(emptf2_vector, 1)
    }
    else
      {
      probfun_val <- (pdist(i) - pdist(a))/(pdist(b) - pdist(a))
      emptf2_vector <- c(emptf2_vector, probfun_val)

    }
  }
  return(emptf2_vector)

}

# Writing the necessary code for Rdist
f3 <- function (value, mean = 0, sd = 1)
{
  uvalues = runif(value, mean, sd)
  qv = pdist(a) + ( uvalues * (pdist(b) - pdist(a)))
  rval = qdist(qv)
  return(rval)
}

demo_list = list(ddist = f1, pdist = f2 ,  rdist = f3)
return (demo_list)

}
```

```r
half_normal <- truncate(a = 0)
xsample <- half_normal$rdist(300)
x <- seq(-3, 3, 0.01)
fx <- half_normal$ddist(x)
Fx <- half_normal$pdist(x)
```

```r
oldPar <- par(mfrow = c(1,3))
plot(x, fx, type = "l", main = "Half normal density")
plot(x, Fx, type = "l", main = "Half normal distribution")
hist(xsample, main = "Half normal sample")
```

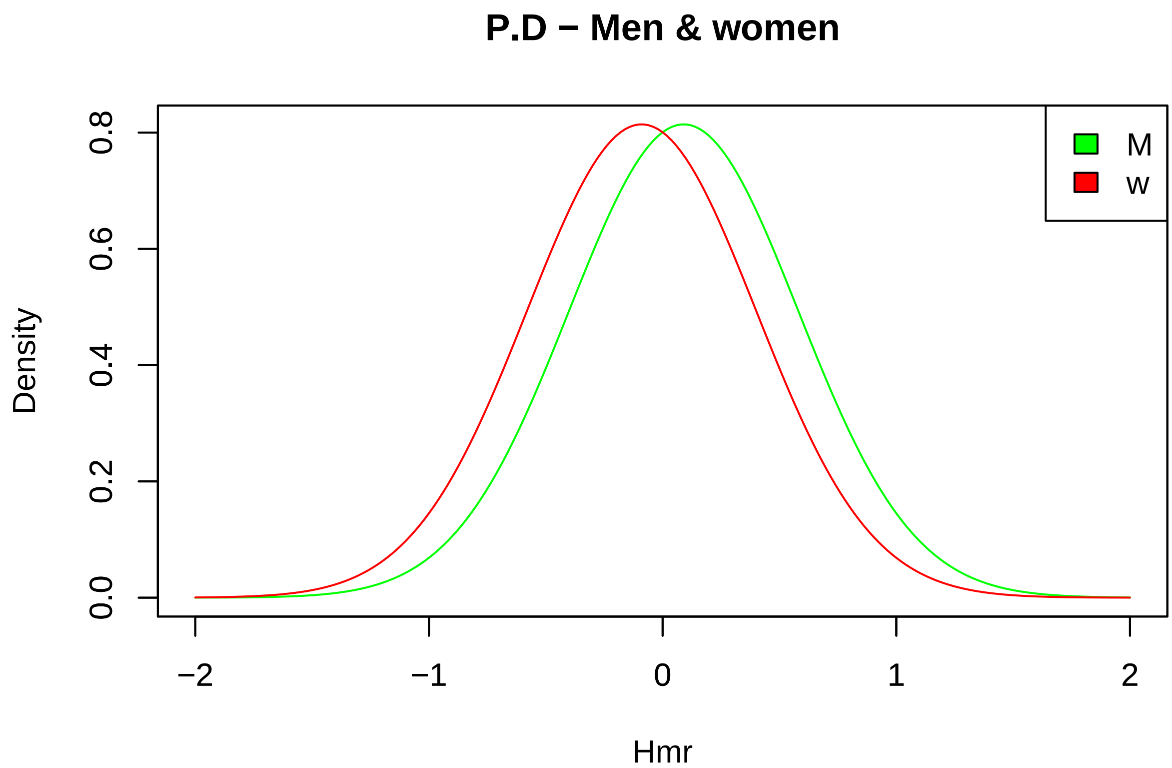



```r
par(oldPar)
```

(C)

(i)

```r
rand <- seq(-2,2,0.02)
men <- dnorm(rand, mean = 0.09, sd = 0.49)
women <- dnorm(rand, mean = -0.09, sd = 0.49)

plot(rand, men, main = "P.D - Men & women", xlab = "Hmr", ylab = "Density", type = "l", col = "green")

par(new = TRUE)
plot(rand, women, type = "l", col = "red", xlab = "", ylab ="")
legend("topright", c("M", "w"), fill = c("green", "red"))
```



(ii)

```
number <- 1000
x <- rnorm(number, mean = -0.09, sd = 0.49)
y <- rnorm(number, mean = 0.09, sd = 0.49)
results <- data.frame(women = x, men = y)

AvgM<- sum(results$men)/number
AvgW <- sum(results$women)/number
totsum <- sum(results$men > results$women)/number

print("Average Humour for Men is")
```

```
## [1] "Average Humour for Men is"
```

```
print(AvgM)
```

```
## [1] 0.07255608
```

```
print("Average Humour for Women is")
```

```
## [1] "Average Humour for Women is"
```

```r
print(AvgW)
```

```
## [1] -0.1225145
```

```r
print("P(Men more funnier than Women)")
```

```
## [1] "P(Men more funnier than Women)"
```

```r
print(totsum)
```

```
## [1] 0.604
```

(iii)

```r
number <- 1000
tru_nor <- truncate(a = 1.07)
y <- tru_nor$rdist(number, mean = 0.09, sd = 0.49)
x <- tru_nor$rdist(number, mean = -0.09, sd = 0.49)
funval <- data.frame(women = x, men = y)
AvgM_Tru_Nor <- sum(funval$men)/number
AvgW_Tru_Nor <- sum(funval$women)/number

totsum <- sum(funval$men > funval$women)/number

print("Average Humour for Men is")
```

```
## [1] "Average Humour for Men is"
```

```r
print(AvgM_Tru_Nor)
```

```
## [1] 1.280538
```

```r
print("Average Humour for Women is")
```

```
## [1] "Average Humour for Women is"
```

```r
print(AvgW_Tru_Nor)
```

```
## [1] 1.214157
```

```r
print("P(Men more funnier than Women)")
```

```
## [1] "P(Men more funnier than Women)"
```

```r
print(totsum)
```

```
## [1] 0.64
```

(iv)

When the full population is taken into account, sample mean of humour for M and W is quite significant(More close). On the other hand when you consider the population limited to humour ability, we can say that the avg humour ability of M was more than W. Also, Probability of M being more funny than W by 65.9%

(v)

```r
number <- 1000
tru_nor <- truncate(a = 1.07)
y <- tru_nor$rdist(number, mean = 0.09, sd = 0.539)
x <- tru_nor$rdist(number, mean = -0.09, sd = 0.49)
funval <- data.frame(women = x, men = y)
AvgM_Tru_Nor <- sum(funval$men)/number
AvgW_Tru_Nor <- sum(funval$women)/number

totsum <- sum(funval$men > funval$women)/number

print("Average Humour for Men is")
```

```
## [1] "Average Humour for Men is"
```

```r
print(AvgM_Tru_Nor)
```

```
## [1] 1.300376
```

```r
print("Average Humour for Women is")
```

```
## [1] "Average Humour for Women is"
```

```r
print(AvgW_Tru_Nor)
```

```
## [1] 1.217177
```

```r
print("P(Men more funnier than Women)")
```

```
## [1] "P(Men more funnier than Women)"
```

```r
print(totsum)
```

```
## [1] 0.699
```

It is evident that avg humour for men is higher than women. Hence we can say that with the same Mean and a higher S.D, the density curve will be more wider.