Experiment 14

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1. Aim: To apply one and two sided single sample t test.

```
x1 = c(40, 26, 39, 14, 42, 18, 25, 43, 46, 27, 19, 47, 19,
       26, 35, 34, 15, 44, 40, 38, 31, 46, 52, 25, 35, 35,
       33, 29, 34, 41)

#(i) and (ii)
# H_0: mu = 32
# H_1: mu != 32
t.test(x1, mu=32)
```

```
##
##  One Sample t-test
##
## data:  x1
## t = 0.68032, df = 29, p-value = 0.5017
## alternative hypothesis: true mean is not equal to 32
## 95 percent confidence interval:
##  29.45874 37.07459
## sample estimates:
## mean of x
##  33.26667
```

```
#(iii)
# H_0: mu = 32
# H_1: mu > 32
t.test(x1, mu=32, alternative = "greater")
```

```
##
##  One Sample t-test
##
## data:  x1
## t = 0.68032, df = 29, p-value = 0.2508
## alternative hypothesis: true mean is greater than 32
## 95 percent confidence interval:
##  30.10313      Inf
## sample estimates:
## mean of x
##  33.26667
```

2. Aim: To carry out two sample t test with equal and unequal, unknown population variances.

```r
X1 = c(74.1, 77.7, 74.0, 74.4, 78.8, 79.3, 72.2, 75.2, 78.2, 77.1, 78.4, 76.3, 75.8, 76.8, 82.8)
Y1 = c(70.8, 74.9, 74.2, 70.4, 69.2, 77.4, 78.1, 72.8, 74.3, 74.7, 72.2, 76.8, 72.4)
# (i) and (ii)
## H_0: mu1 = mu2
## H_1: mu1 != mu2

# For equal and unknown population variances
t.test(X1,Y1, var.equal = T)
```

```
##
##  Two Sample t-test
##
## data:  X1 and Y1
## t = 2.98, df = 26, p-value = 0.006178
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  0.9406902 5.1239252
## sample estimates:
## mean of x mean of y
##  76.74000  73.70769
```

```r
# For unequal and unknown population variances
t.test(X1,Y1)
```

```
##
##  Welch Two Sample t-test
##
## data:  X1 and Y1
## t = 2.9718, df = 25.132, p-value = 0.006439
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  0.9313778 5.1332376
## sample estimates:
## mean of x mean of y
##  76.74000  73.70769
```

3. Aim: To carry out paired t test

```r
before = c(109, 112, 98, 114, 102, 97, 88, 101, 89, 91)
after = c(115, 120, 99, 117, 105, 98, 91, 99, 93, 89)
# H_0: There is no significant gain in weight as a result of the change of diet.
# H_1: There is a significant gain in weight as a result of the change of diet.

t.test(before, after, paired = T)
```

```
##
##  Paired t-test
##
## data:  before and after
## t = -2.4931, df = 9, p-value = 0.03425
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
```

```
## -4.7684322 -0.2315678
## sample estimates:
## mean of the differences
##                    -2.5
```

4. Aim: To test that in the corresponding population, correlation coefficient is significantly different from zero

```
cor.test(before, after)
```

```
##
##  Pearson's product-moment correlation
##
## data:  before and after
## t = 10.989, df = 8, p-value = 4.181e-06
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.8681871 0.9927374
## sample estimates:
##       cor
## 0.9684347
```

5. Aim: To compute the densities, cdfs, inv cdfs, random sample for t distribution using R

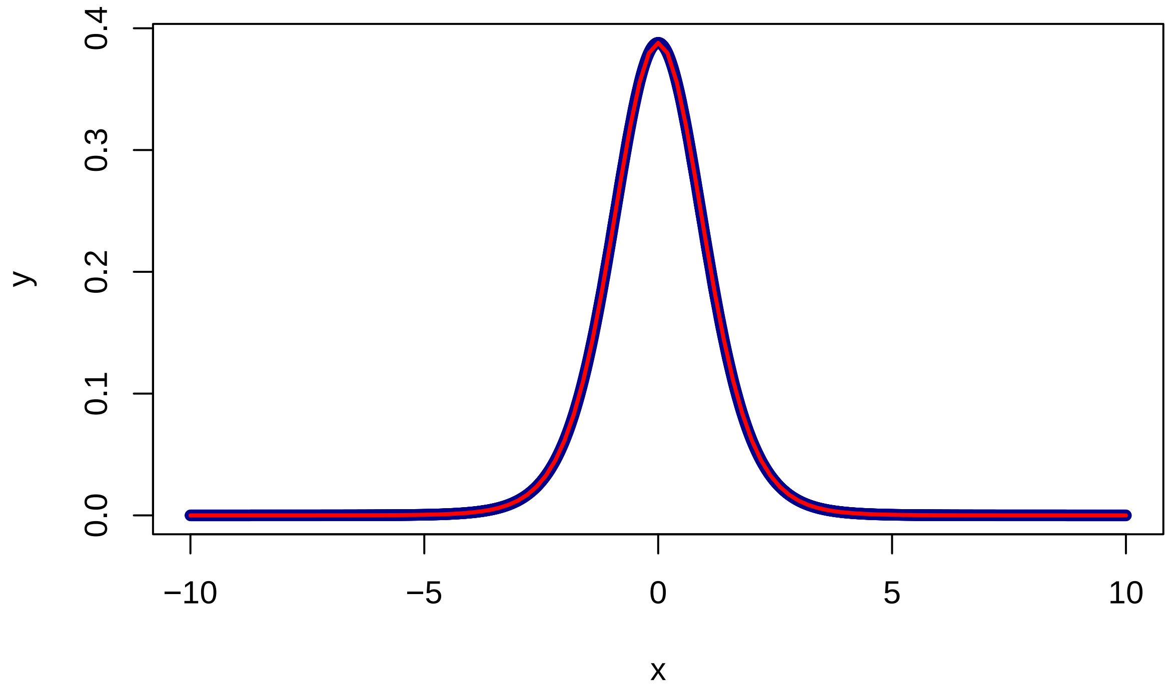
```
##(i) Probably density function of t-distribution:

# (a) f(0), with df=8
dt(0,8)
```

```
## [1] 0.386699
```

```
# (b) f(5), with df=15
dt(5,15)
```

```
## [1] 0.000153436
```

```
# (c) To Generate a sequence x<- seq(-10,10,by=.01) and also y<- dt(x) with df=9, for t-distribution
x = seq(-10, 10, by=0.01)
y = dt(x,9)

# plot (x,y). Draw the curve on (x,y) plot.
plot(x,y,pch=20,col="blue4") # plot(x,y)
curve(dt(x,9),-10,10, lwd=2, col="red", add = TRUE)  #curve
```




```r
# (ii) Cumulative distribution function of t-distribution:

# (a) F(3), with df=14
pt(3,14)
```

```
## [1] 0.9952242
```

```r
# (b) F(0) with df=6
pt(0,6)
```

```
## [1] 0.5
```

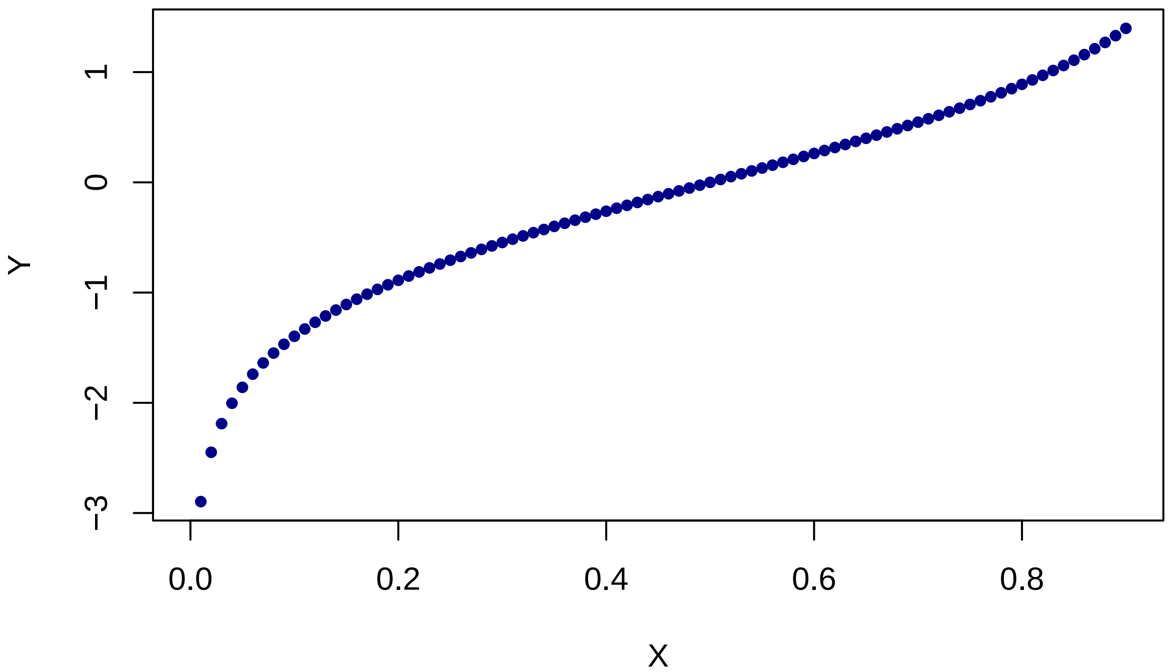
```r
# (iii) Inverse cumulative distribution function of t-distribution:

# (a) F^-1 (0), with df=3
qt(0,3)
```

```
## [1] -Inf
```

```r
# ( b) F^-1 (0.6) with df=5
qt(0.6,5)
```

```
## [1] 0.2671809
```

```r
# (c) Generate a sequence x<- seq(0,.9 by=.01) and also y<- qt(x) with df=8, then plot (x,y).
X = seq(0, 0.9, 0.01)
Y = qt(X,8)
plot(X,Y, pch=20 ,col="blue4")
```




```r
# (iv) To Generate a random sample of 50 observations from a t- distribution with df=12.
rt(50,12)
```

```
##  [1] -0.12947834  0.76126534  0.91290056 -0.95163193  1.28562214  2.04171350
##  [7]  0.70570319  0.01306094 -2.79732980 -1.03836432  0.93058190  0.54264775
## [13]  3.59602369  0.91575307 -0.28261837 -0.46455430  0.27684267 -2.31020640
## [19] -1.99280503  2.07600693  0.30271017  0.19334119  0.40658475 -0.38235588
## [25]  2.01027929 -0.16615147  0.88413722 -2.12525089  1.30661467  0.40616262
## [31]  0.01716907 -0.73515109  0.61411800  1.67844859  0.76584918  0.12146420
## [37]  1.76979596 -1.04505967  0.12600650  0.46293645 -0.46818031 -1.43982760
## [43] -0.16019493 -2.29761307 -1.86327091  1.20420662 -0.26304315 -1.06878283
## [49] -0.10763935  0.82562232
```