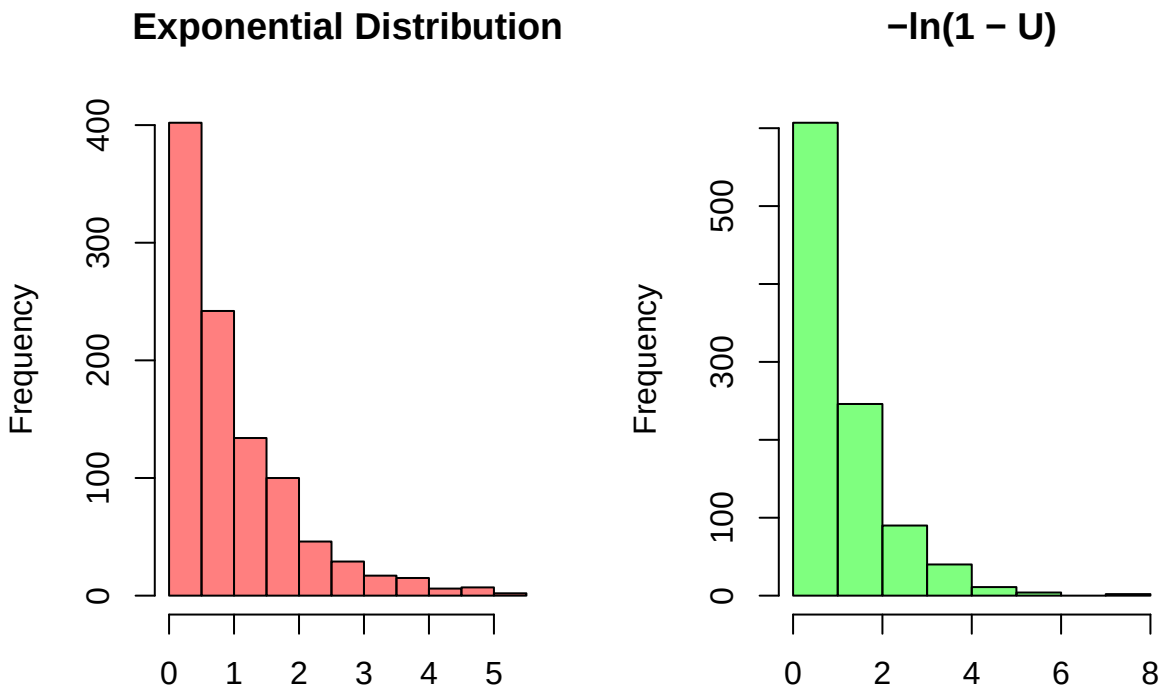
Stat 110: R Section

Credit to Joe Blitzstein, Kenneth Baclawski, & Matt DosSantos DiSorbo

Justin Zhu

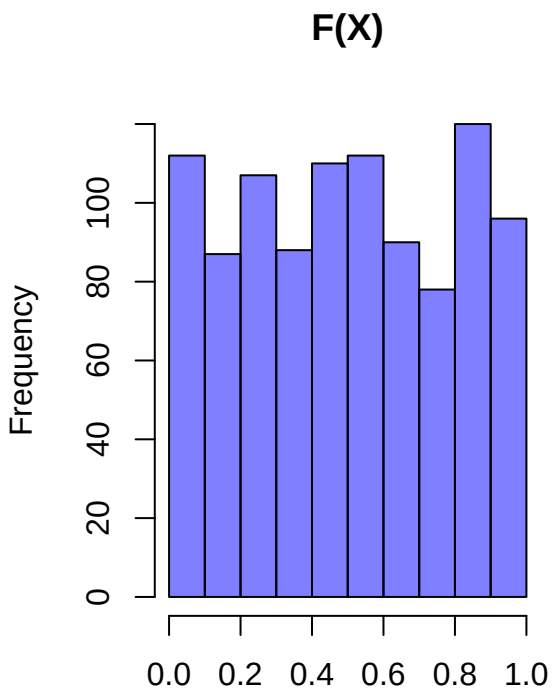
Universality of the Uniform

```
#set grid
par(mfrow = c(1,2))

#Exponential
hist(rexp(1000), col = rgb(1, 0, 0, 1/2),
     main = "Exponential Distribution",
     xlab = "")

#transformed Uniform
hist(-log(1 - runif(1000)), col = rgb(0, 1, 0, 1/2),
     main = "-ln(1 - U)", xlab = "")
```




```
#generate the r.v., an Expo(1)
X = rexp(1000, 1)

#plot F(X)
```

```
hist(pexp(X, 1), col = rgb(0, 0, 1, 1/2),
     main = "F(X)", xlab = "")
```



Normal

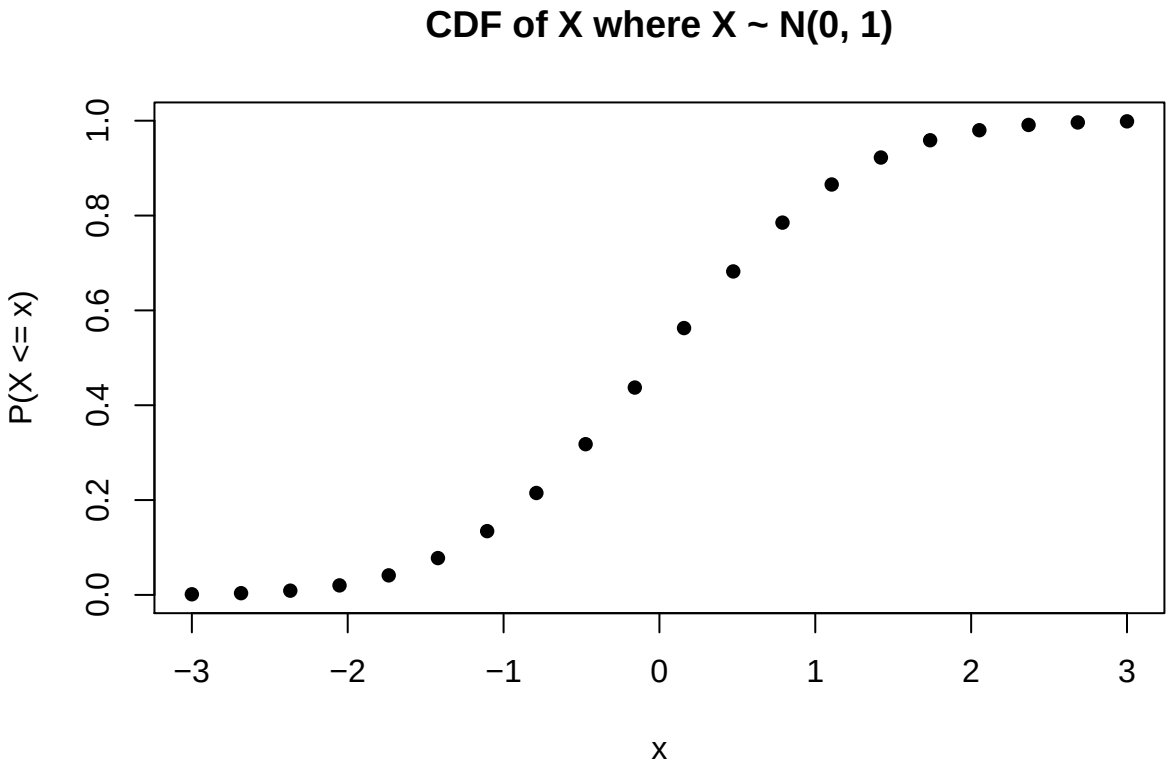
```
#68-95-99.7 Rule
pnorm(1) - pnorm(-1); pnorm(2) - pnorm(-2); pnorm(3) - pnorm(-3)
```

```
## [1] 0.6826895
```

```
## [1] 0.9544997
```

```
## [1] 0.9973002
```

```
#plot the CDF
plot(seq(from = -3, to = 3, length.out = 20), pnorm(seq(from = -3, to = 3, length.out =
     xlab = "x", ylab = "P(X <= x)", main = "CDF of X where X ~ N(0, 1)",
     type = "p", pch = 16)
```



Memoryless of the Exponential

```
#replicate
set.seed(110)
sims = 1000

#define simple parameters (n, p for binomial and geometric) and value of k
n = 10
lambda = 1/10
mu = 3
sigma = 1
k = 5

#generate the r.v.s
X = rexp(sims, lambda)
Y = rnorm(sims, mu, sigma)

#graphics
#set graphic grid
par(mfrow = c(2,2))

#overall histogram
```

```r
hist(X, main = "X ~ Expo(lambda)", xlab = "", freq = FALSE,
     col = rgb(1, 0, 0, 1/4))

#condition
hist(X[X > k] - k, main = "(X - k)|X > k", freq = FALSE,
     xlab = "", col = rgb(1, 0, 0, 1/4))


#overall histogram
hist(Y, main = "Y ~ N(mu, sigma^2)", xlab = "", freq = FALSE,
     col = rgb(0, 1, 0, 1/4))

#condition
hist(Y[Y > k] - k, main = "(Y- k)|Y > k", freq = FALSE,
     xlab = "", col = rgb(0, 1, 0, 1/4))
```