FIGURE A

```
set.seed(1212)
m = 10000;  u = runif(m);  x = sqrt(u)
par(mfrow=c(1,2))
  hh = seq(-.1, 1.1, length=1000); cutp = seq(0, 1, by = .1)
  hist(u, breaks=cutp, prob=T, col="wheat", ylim=c(0,2),
    xlim=c(-.1, 1.1), main="UNIF(0,1)")
    lines(hh, dunif(hh), col="blue", lwd=2)
  hist(x, breaks=sqrt(cutp), prob=T, col="wheat",
    xlim=c(-.1, 1.1), main="BETA(1,2)")
    lines(hh, dbeta(hh, 2, 1), col="blue", lwd=2)
par(mfrow=c(1,1))
```
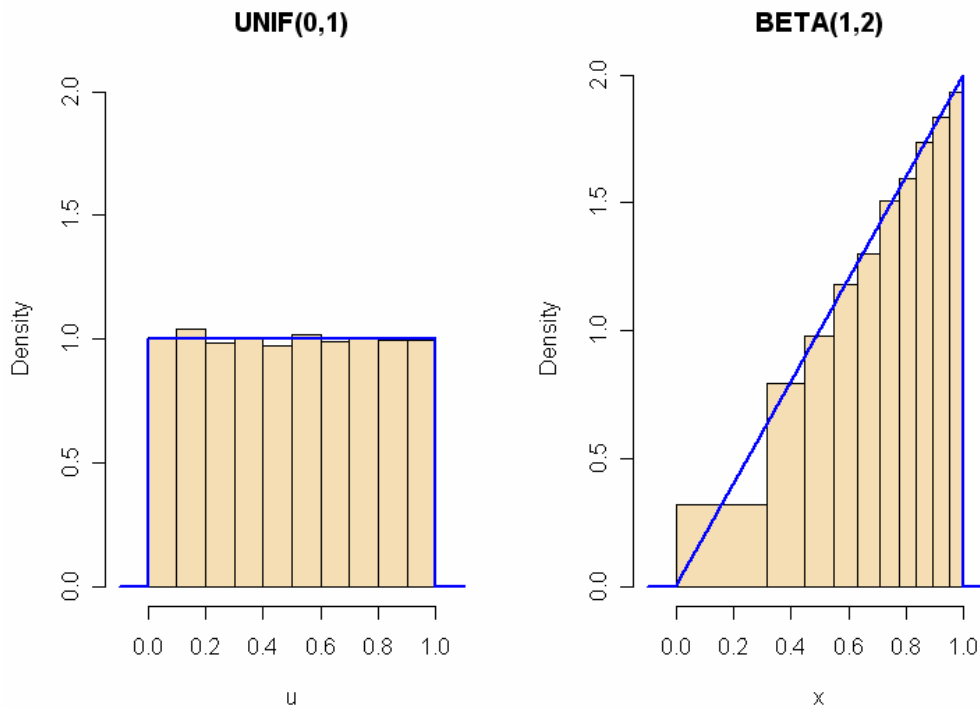
FIGURE B

```
set.seed(1234)
m = 100000;   u = runif(m);   x = -log(u)
hist(x, prob=T, col="wheat", main="EXP(1)")
  xx = seq(0, max(x), length=100)
  lines(xx, dexp(xx, 1), col="blue", lwd=2)
```
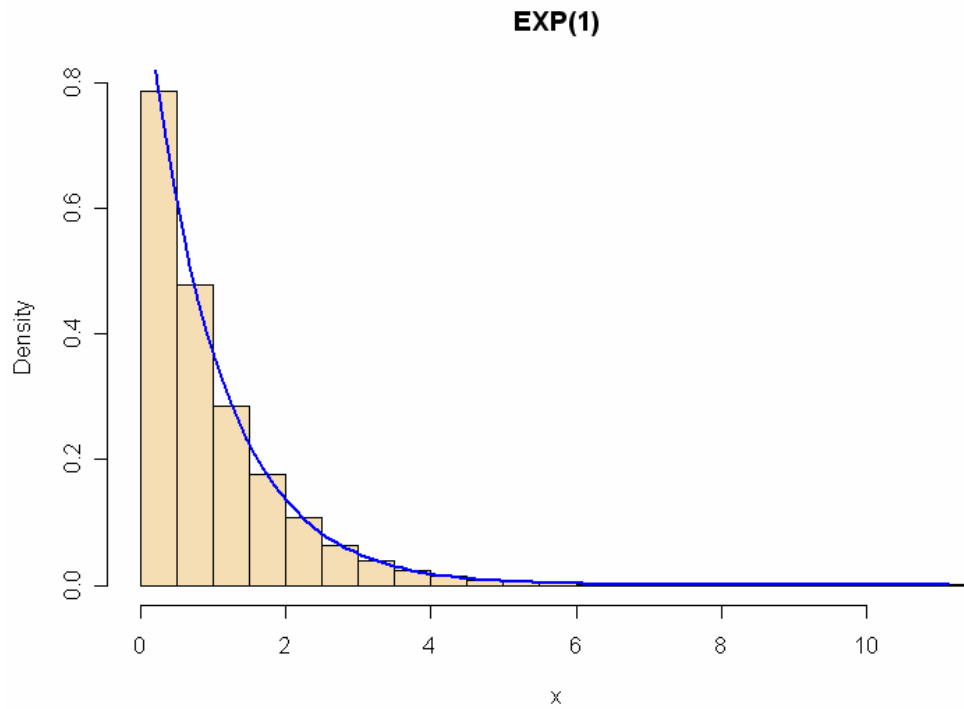
FIGURE C

```
par(mfrow=c(1,2))

xx = seq(-.5, 6.5, length=1000)
plot(xx, pbinom(xx, 6, 1/4), type="s", lty="dotted",
  col="darkred", xlab="Number of Successes",
    ylab="CDF")
  points(xx, pbinom(xx, 6, 1/4), pch=20,
    col="darkgreen")
  points(0:6, pbinom(0:6, 6, 1/4), pch=19)

qq = seq(0, 1, length=1000)
plot(qq, qbinom(qq, 6, 1/4), type="s", lty="dotted",
  col="darkgreen", xlab="Cumulative Probability",
    ylab="Quantile")
  points(qq, qbinom(qq, 6, 1/4), pch=20,
    col="darkred")
  q = pbinom(0:6, 6, 1/4)
  points(q, qbinom(q, 6, 1/4), pch=19)

par(mfrow=c(1,1))
```
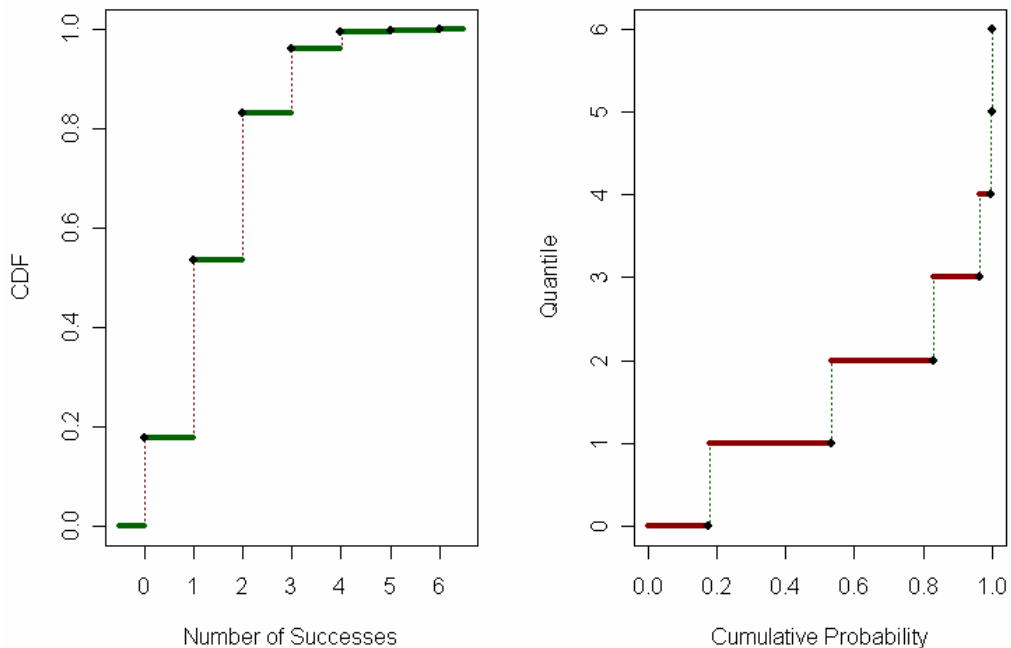
FIGURE D

```
set.seed(123)
m = 5000;  kap = 3;  xx = seq(1, 10, length=1000)
pdf = kap/xx^(kap+1)
x = (1 - runif(m))^(-1/kap)
mean(x);  var(x)
cutp=seq(0, max(x)+.5, by=.5)
hist(x[x<10], prob=T, col="wheat", main="Pareto")
lines(xx, pdf, col="blue", lwd=2)
```
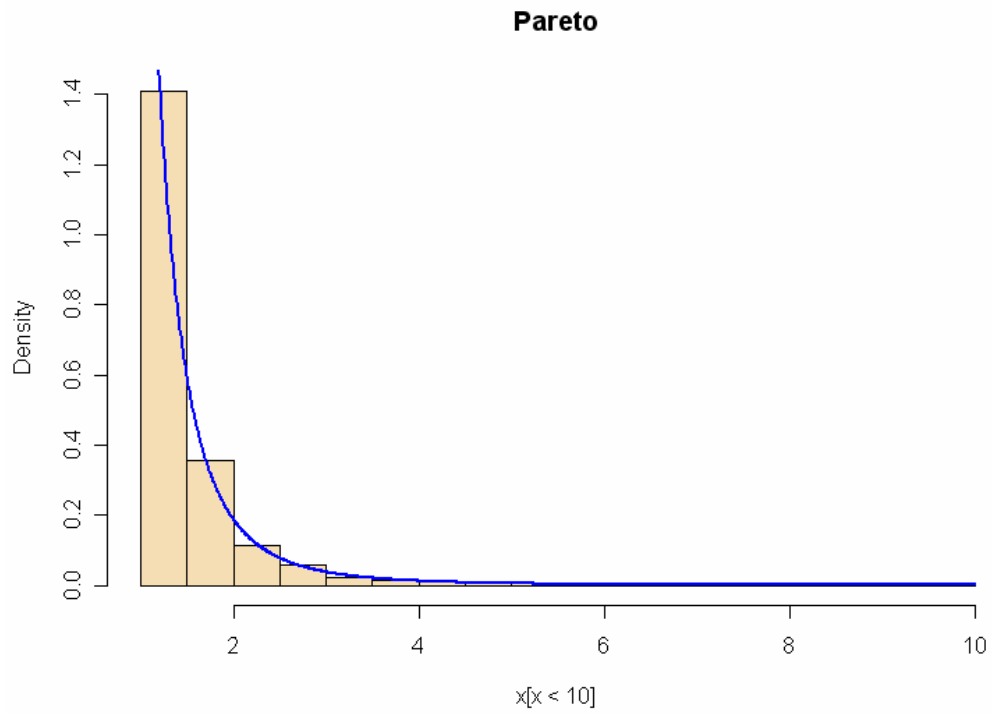
Pareto

FIGURE E

```
set.seed(12)
m = 10000;  z1 = rnorm(m);  z2 = rnorm(m)
x = z1^2;  q = z1^2 + z2^2
par(mfrow=c(2,1))
  mx=max(x, q);  xx = seq(0, mx, length=1000)
  hist(x, prob=T, ylim=c(0,.7), xlim=c(0, mx),
col="wheat", main="CHISQ(1)")
  lines(xx, dchisq(xx, 1), col="blue", lwd=2)
  hist(q, prob=T, ylim=c(0,.7), xlim=c(0, mx),
col="wheat", main="CHISQ(2)")
  lines(xx, dexp(xx, 1/2), col="red")
  lines(xx, dchisq(xx, 2), col="blue", lwd=2,
lty="dashed")
par(mfrow=c(1,1))
```
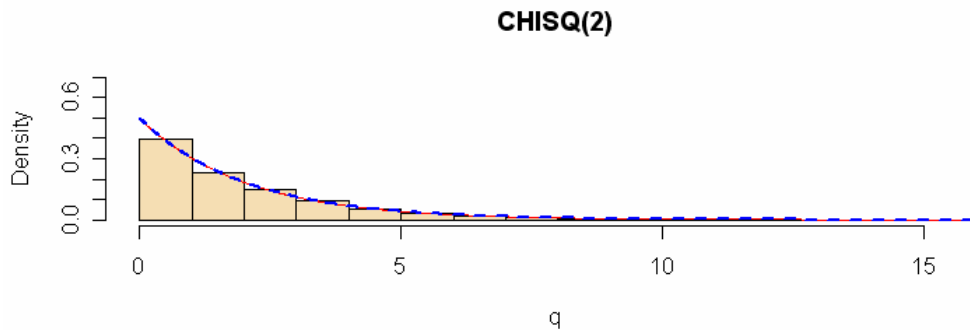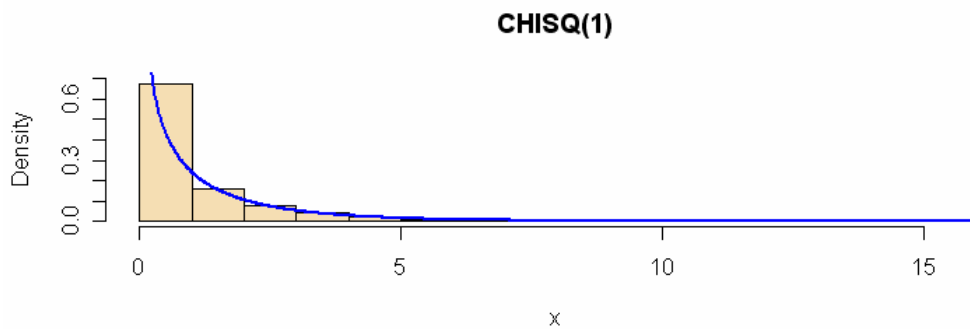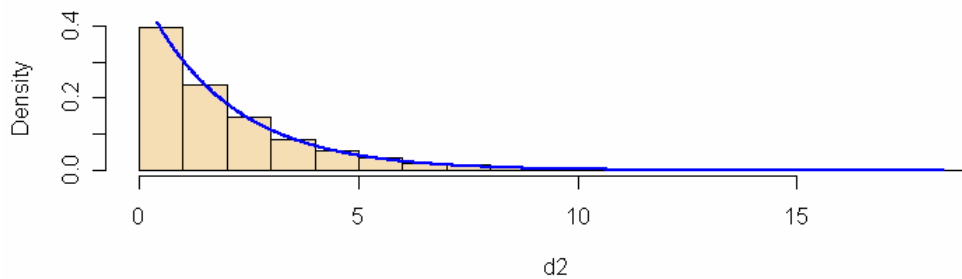
FIGURE F

```
set.seed(1212)
m = 10000
z1 = rnorm(m);   z2 = rnorm(m)

par(mfrow=c(2,1))
# squared distance from origin
  d2 = z1^2 + z2^2
  hist(d2, prob=T, col="wheat")
    dd = seq(0, max(d2), length=1000)
    lines(dd, dchisq(dd, 2), col="blue", lwd=2)

# angle in degrees (counterclockwise from right)
  th = ((180/pi)*atan(z1/z2) + 180*(z1<0)) %% 360
  hist(th, prob=T, col="wheat")
   tt = seq(0, 360, length = 1000)
   lines(tt, dunif(tt, 0, 360), col="blue", lwd=2)
par(mfrow=c(1,1))
```
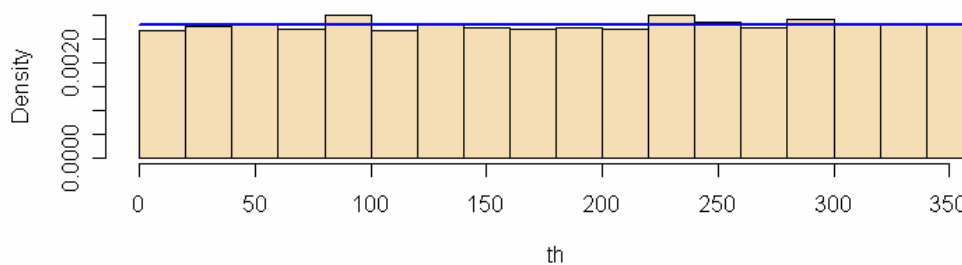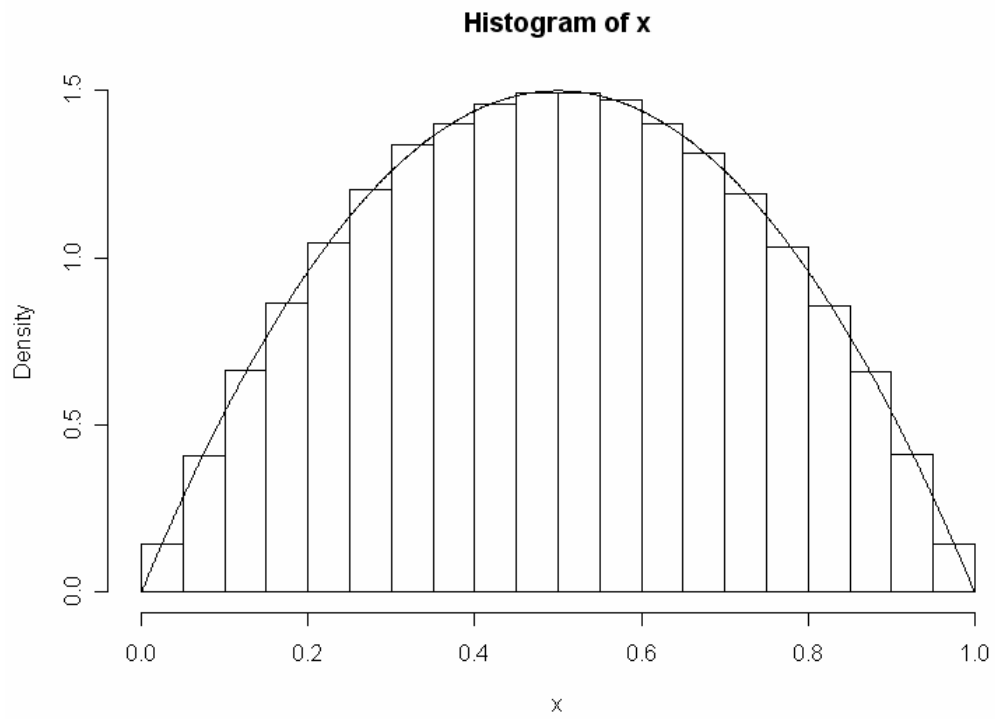

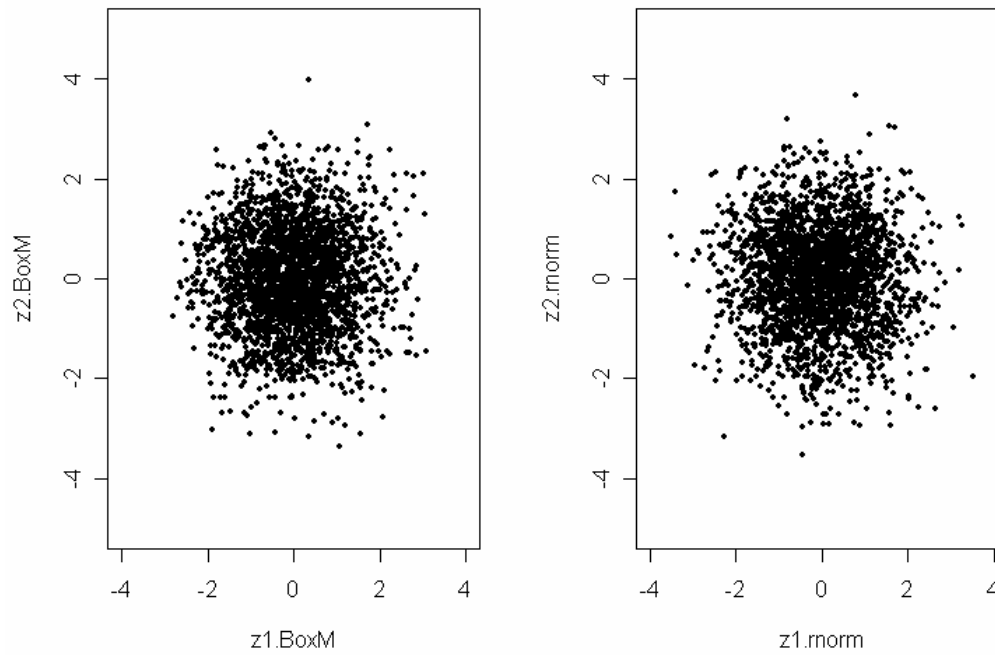Histogram of d2

Histogram of th

Figures for Problems 3, 9, and 10

3. Acceptance Rejection BETA Figure

Histogram of x

9.   Box-Muller Figure

10. CLT Approx. Figure