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Gazdasági és Pénzügyi Modellek vizsga, 2022.05.05.

Értékek generálása:

```
> x="fb8ypq";#neptun kód
> z=charToRaw(iconv(x, "latin1", "UTF-8"))
> for (i in 1:6) v=paste("0x",z,sep="")
> e=strtoi(v)
> ax=e[1];ay=e[2];az=e[3];av=e[4];ss=sum(strtoi(v))+24
> cat("ax=",ax,"\n")
ax= 102
> cat("ay=",ay,"\n")
ay= 98
> cat("az=",az,"\n")
az= 56
> cat("av=",av,"\n")
av= 121
> cat("ss=",ss,"\n")
ss= 626
> ar=c( "FB","AAPL","AMZN","GOOG","NFLX","TSLA")
> ai=ss-6*floor(ss/6)
> ev=2020-(ss-10*floor(ss/10))
> cat("ev=",ev,"\n")
ev= 2014
> cat("reszveny=",ar[ai+1],"\n")
reszveny= AMZN
```

Tehát az egyes értékek:

- ax = 102
- ay = 98
- az = 56
- av = 121
- ss = 626
- ev = 2014
- reszveny = AMZN

1. feladat:

Mintarealizáció generálása:

```
> set.seed(ss)
> nx=1000
> v=matrix(c(ax,abs(ax-az),abs(ax-az),az),2)
> w=chol(v)
> z1=rexp(nx)
> z2=rexp(nx)
> zm=matrix(c(z1,z2),ncol=2)
> zn=zm%*%w
```

Ennek statisztikai elemzése:

```
> summary(zn) #statisztikai adatok
       V1                  V2
 Min.   : 0.01379   Min.   : 0.1853
 1st Qu.: 2.92655   1st Qu.: 5.0040
 Median : 6.80803   Median : 9.2206
 Mean   :10.55387   Mean   :10.7965
 3rd Qu.:15.07219   3rd Qu.:14.7259
 Max.   :73.34966   Max.   :57.3531
> skewness(zn) #ferdeség
[1] 2.026479 1.353471
> kurtosis(zn) #lapultság
           [,1]     [,2]
[1,]  1.962889 23.28414
[2,] 23.284143 17.34454
```

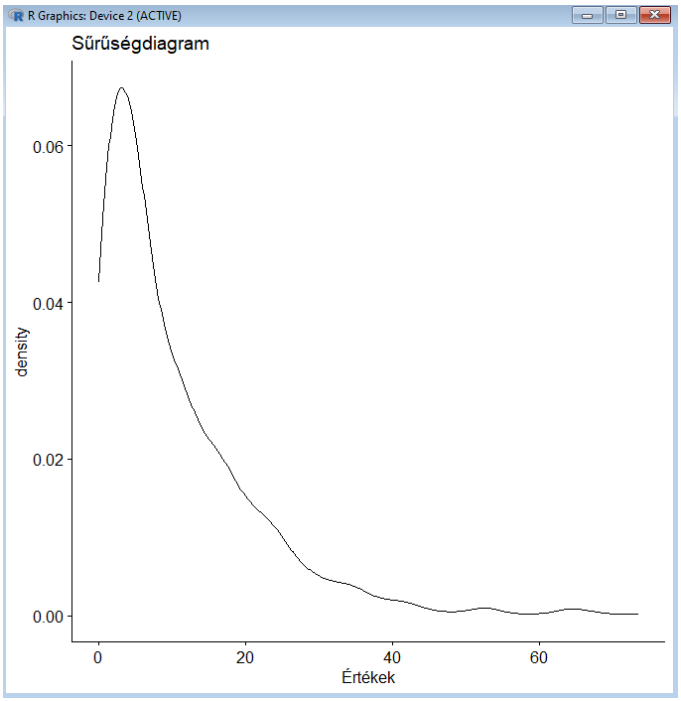
Min: Minimum értékek.
1st Qu.: Első kvartilis, a megfigyelések 25%-a ennél a mennyiségnél alacsonyabb
Median: Medián
Mean: Átlag
3rd Qu.: .: Harmadik kvartilis, a megfigyelések 25%-a ennél mennyiségnél alacsonyabb
Max: Maximum értékek

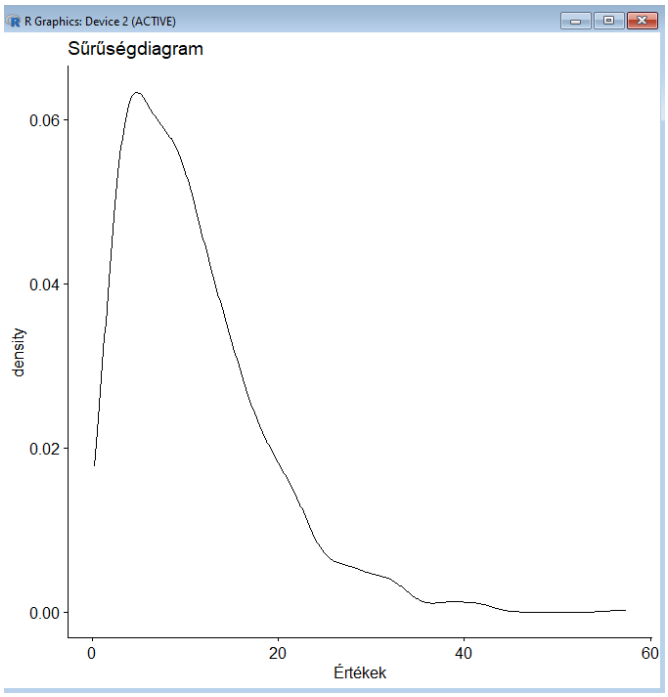
A *skewness(zn)* függvénnyel a **ferdeség** vizsgálatát, a *kurtois(zn)* függvénnyel pedig a **lapultság** vizsgálatát végeztem el.

Eloszlás vizsgálata:
Vizuális igazolás beépített függvényekkel.
Sűrűségdiagrammal: A görbe bizonyítja a poisson eloszlást.

```
> ggdensity(zn[,1],
+           main = "Sűrűségdiagram",
+           xlab = "Értékek")
> ggdensity(zn[,2],
+           main = "Sűrűségdiagram",
+           xlab = "Értékek")
> library("car")
```

Az ábrázolt függvények:



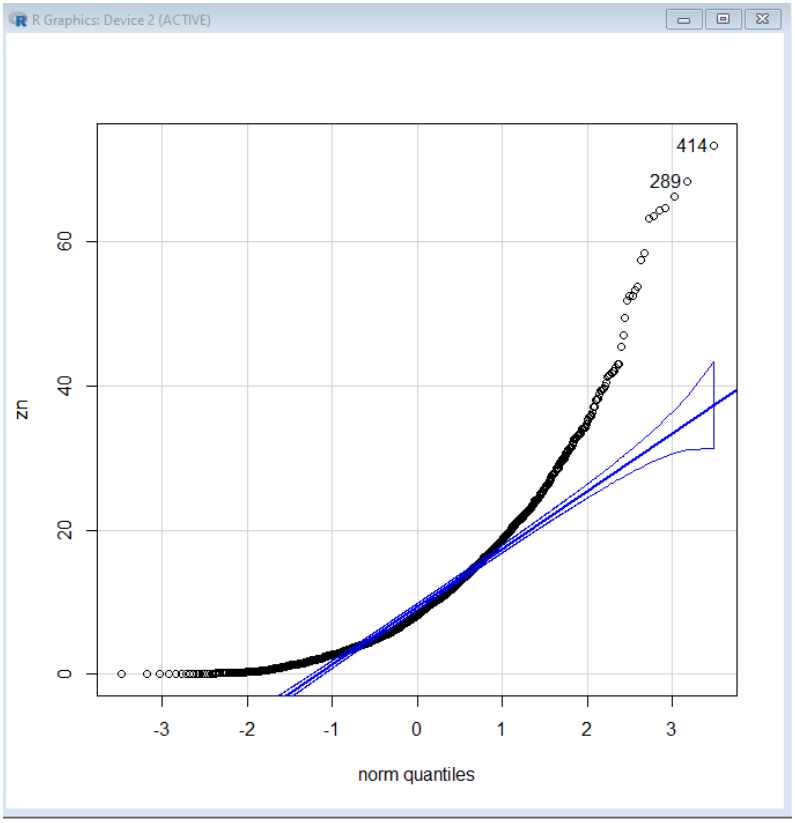


Vizsgálat Kvantilis diagram alapján:

Megrajzolja az összefüggést egy adott minta és a normális eloszlás között, 45 fokos referenciavonalon.

```
> qqPlot(zn)
```

Az ábrázolt függvény:



2.feladat:

Brown folyamat generálása:

Ciklusokkal:

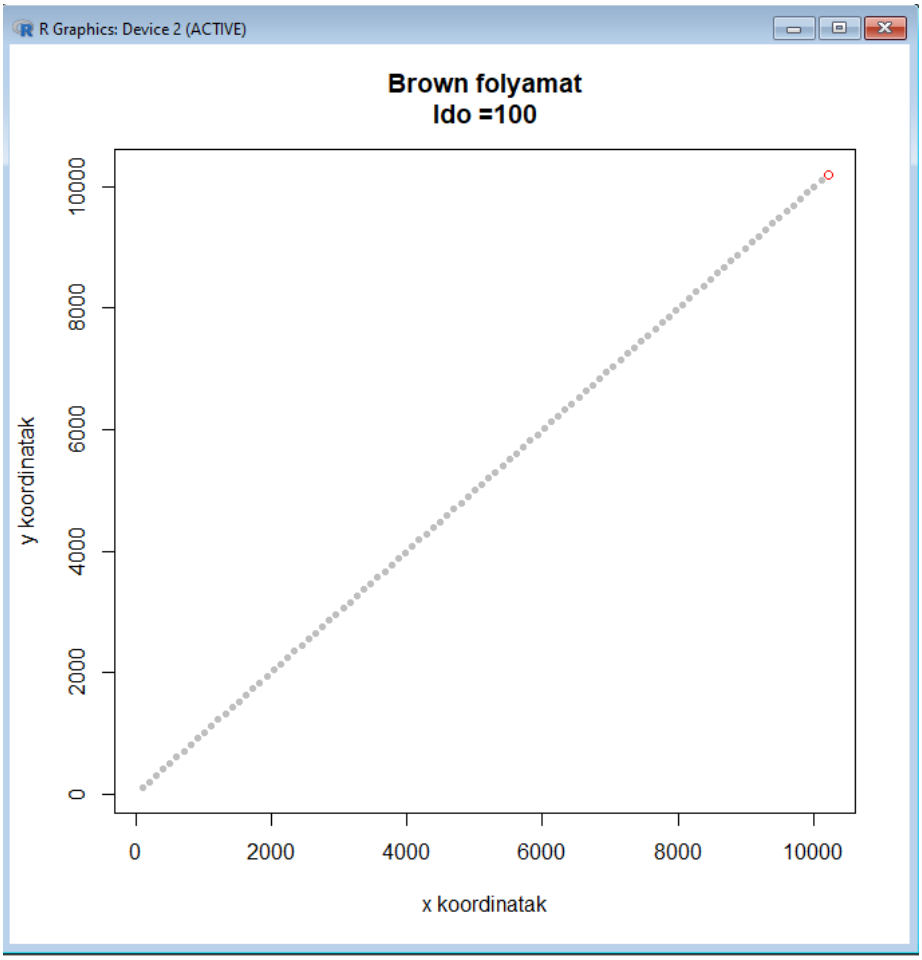
```
> gbm_ciklus <- function(nsim = 100, t = 100, mu = ax, sigma = (ax+az)/(ax+ay+az), S0 = 100, dt = 1./365) {
+   gbm <- matrix(ncol = nsim, nrow = t)
+   for (simu in 1:nsim) {
+     gbm[1, simu] <- S0
+     for (day in 2:t) {
+       epsilon <- rnorm(1)
+       dt = 1 / 365
+       gbm[day, simu] <- gbm[(day-1), simu] * exp((mu - sigma * sigma / 2) * dt + sigma * epsilon * sqrt(dt))
+     }
+   }
+   return(gbm)
+ }
```

Értékek beállítása és vizsgálata:

```
>  nsim <- 50
> t <- 100
> mu <- ax
> sigma <- (ax+az)/(ax+ay+az)
> S0 <- 100
> set.seed(ss+37)
> gbm <- gbm_ciklus(nsim, t, mu, sigma, S0)
> summary(gbm)
```

```
> summary(gbm)
       V1                  V2                  V3                  V4                  V5                  V6                  V7                  V8                  V9                 V10                 V11
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:9.181e+04   1st Qu.:1.261e+05   1st Qu.:8.210e+04   1st Qu.:9.521e+04   1st Qu.:1.145e+05   1st Qu.:1.292e+05   1st Qu.:7.703e+04   1st Qu.:8.990e+04   1st Qu.:6.636e+04   1st Qu.:8.755e+04   1st Qu.:8.874e+04
 Median :1.047e+08   Median :1.366e+08   Median :8.882e+07   Median :9.159e+07   Median :1.298e+08   Median :1.196e+08   Median :9.177e+07   Median :9.652e+07   Median :9.041e+07   Median :8.076e+07   Median :9.150e+07
 Mean   :5.271e+12   Mean   :5.219e+12   Mean   :3.170e+12   Mean   :4.360e+12   Mean   :3.941e+12   Mean   :5.186e+12   Mean   :4.035e+12   Mean   :4.439e+12   Mean   :2.315e+12   Mean   :3.215e+12   Mean   :3.427e+12
 3rd Qu.:9.541e+10   3rd Qu.:1.386e+11   3rd Qu.:8.692e+10   3rd Qu.:9.335e+10   3rd Qu.:9.289e+10   3rd Qu.:1.302e+11   3rd Qu.:9.624e+10   3rd Qu.:1.235e+11   3rd Qu.:6.174e+10   3rd Qu.:8.573e+10   3rd Qu.:8.956e+10
 Max.   :1.327e+14   Max.   :1.324e+14   Max.   :7.721e+13   Max.   :1.124e+14   Max.   :9.414e+13   Max.   :1.317e+14   Max.   :9.703e+13   Max.   :1.041e+14   Max.   :5.767e+13   Max.   :7.344e+13   Max.   :7.946e+13
       V12                 V13                 V14                 V15                 V16                 V17                 V18                 V19                 V20                 V21                 V22
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:1.019e+05   1st Qu.:1.098e+05   1st Qu.:1.139e+05   1st Qu.:9.622e+04   1st Qu.:1.066e+05   1st Qu.:8.897e+04   1st Qu.:8.864e+04   1st Qu.:7.373e+04   1st Qu.:1.180e+05   1st Qu.:1.007e+05   1st Qu.:1.065e+05
 Median :9.959e+07   Median :8.941e+07   Median :1.142e+08   Median :9.996e+07   Median :8.954e+07   Median :1.234e+08   Median :7.515e+07   Median :8.792e+07   Median :9.516e+07   Median :8.145e+07   Median :1.041e+08
 Mean   :4.588e+12   Mean   :3.026e+12   Mean   :4.033e+12   Mean   :4.875e+12   Mean   :5.080e+12   Mean   :5.315e+12   Mean   :4.340e+12   Mean   :4.650e+12   Mean   :5.572e+12   Mean   :3.196e+12   Mean   :4.327e+12
 3rd Qu.:9.568e+10   3rd Qu.:8.840e+10   3rd Qu.:1.151e+11   3rd Qu.:9.618e+10   3rd Qu.:1.290e+11   3rd Qu.:1.498e+11   3rd Qu.:9.011e+10   3rd Qu.:9.522e+10   3rd Qu.:1.376e+11   3rd Qu.:1.011e+11   3rd Qu.:1.044e+11
 Max.   :1.159e+14   Max.   :7.587e+13   Max.   :9.291e+13   Max.   :1.209e+14   Max.   :1.251e+14   Max.   :1.155e+14   Max.   :1.071e+14   Max.   :1.132e+14   Max.   :1.370e+14   Max.   :7.897e+13   Max.   :1.070e+14
       V23                 V24                 V25                 V26                 V27                 V28                 V29                 V30                 V31                 V32                 V33
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:1.294e+05   1st Qu.:1.117e+05   1st Qu.:1.402e+05   1st Qu.:9.885e+04   1st Qu.:9.875e+04   1st Qu.:8.270e+04   1st Qu.:7.244e+04   1st Qu.:8.402e+04   1st Qu.:7.407e+04   1st Qu.:1.184e+05   1st Qu.:9.440e+04
 Median :1.077e+08   Median :1.080e+08   Median :1.715e+08   Median :8.234e+07   Median :8.719e+07   Median :8.482e+07   Median :7.792e+07   Median :1.095e+08   Median :8.446e+07   Median :1.471e+08   Median :8.052e+07
 Mean   :4.194e+12   Mean   :4.480e+12   Mean   :7.513e+12   Mean   :3.255e+12   Mean   :3.549e+12   Mean   :3.472e+12   Mean   :2.608e+12   Mean   :3.334e+12   Mean   :3.495e+12   Mean   :5.252e+12   Mean   :2.642e+12
 3rd Qu.:1.215e+11   3rd Qu.:9.485e+10   3rd Qu.:1.451e+11   3rd Qu.:8.529e+10   3rd Qu.:1.079e+11   3rd Qu.:7.590e+10   3rd Qu.:5.729e+10   3rd Qu.:8.355e+10   3rd Qu.:6.080e+10   3rd Qu.:1.464e+11   3rd Qu.:8.751e+10
 Max.   :1.005e+14   Max.   :1.120e+14   Max.   :1.870e+14   Max.   :8.150e+13   Max.   :8.590e+13   Max.   :8.861e+13   Max.   :6.406e+13   Max.   :7.754e+13   Max.   :8.698e+13   Max.   :1.276e+14   Max.   :5.905e+13
       V34                 V35                 V36                 V37                 V38                 V39                 V40                 V41                 V42                 V43                 V44
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:7.907e+04   1st Qu.:1.020e+05   1st Qu.:9.790e+04   1st Qu.:1.015e+05   1st Qu.:8.975e+04   1st Qu.:1.092e+05   1st Qu.:8.743e+04   1st Qu.:9.114e+04   1st Qu.:1.056e+05   1st Qu.:1.155e+05   1st Qu.:1.063e+05
 Median :5.986e+07   Median :1.196e+08   Median :8.827e+07   Median :1.153e+08   Median :8.229e+07   Median :1.033e+08   Median :6.346e+07   Median :1.037e+08   Median :1.078e+08   Median :1.145e+08   Median :1.119e+08
 Mean   :2.566e+12   Mean   :7.946e+12   Mean   :3.757e+12   Mean   :5.437e+12   Mean   :2.447e+12   Mean   :3.923e+12   Mean   :2.456e+12   Mean   :6.440e+12   Mean   :4.155e+12   Mean   :4.689e+12   Mean   :4.356e+12
 3rd Qu.:5.950e+10   3rd Qu.:1.453e+11   3rd Qu.:8.299e+10   3rd Qu.:1.273e+11   3rd Qu.:8.410e+10   3rd Qu.:1.104e+11   3rd Qu.:6.515e+10   3rd Qu.:1.289e+11   3rd Qu.:1.044e+11   3rd Qu.:1.056e+11   3rd Qu.:1.173e+11
 Max.   :5.988e+13   Max.   :2.044e+14   Max.   :9.349e+13   Max.   :1.328e+14   Max.   :5.421e+13   Max.   :9.583e+13   Max.   :6.078e+13   Max.   :1.603e+14   Max.   :1.021e+14   Max.   :1.116e+14   Max.   :1.073e+14
       V45                 V46                 V47                 V48                 V49                 V50
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:1.194e+05   1st Qu.:1.345e+05   1st Qu.:8.680e+04   1st Qu.:1.286e+05   1st Qu.:1.177e+05   1st Qu.:1.078e+05
 Median :1.196e+08   Median :1.580e+08   Median :1.159e+08   Median :1.019e+08   Median :1.115e+08   Median :1.549e+08
 Mean   :4.855e+12   Mean   :7.360e+12   Mean   :4.228e+12   Mean   :3.314e+12   Mean   :3.979e+12   Mean   :9.629e+12
 3rd Qu.:1.103e+11   3rd Qu.:1.733e+11   3rd Qu.:9.822e+10   3rd Qu.:1.070e+11   3rd Qu.:8.081e+10   3rd Qu.:2.112e+11
 Max.   :1.217e+14   Max.   :1.869e+14   Max.   :1.041e+14   Max.   :7.414e+13   Max.   :9.571e+13   Max.   :2.526e+14
```

Ábrázolása:

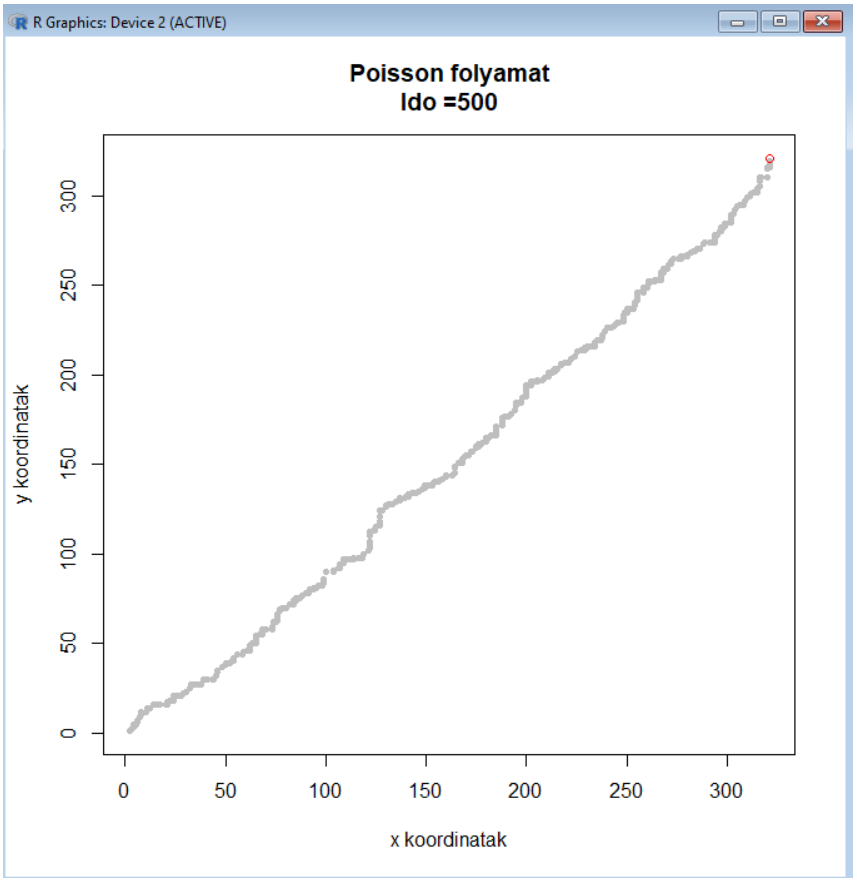


3.feladat:

Poisson folyamat generálása:

```
> poisson <- function(){
+ set.seed(ss+17)
+ x <- y <- x.new <- y.new <- x.new.p <- y.new.p <- vector()
+ for(i in 1:500){
+ x <- rpois(1, (ax+az)/(ax+ay+az))
+ y <- rpois(1, (ax+az)/(ax+ay+az))
+     x.new <- c(x.new, x)
+     y.new <- c(y.new, y)
+ x.new.p <- cumsum(x.new)
+ y.new.p <- cumsum(y.new)
+ plot(x.new.p, y.new.p, type="b", main=paste("Poisson folyamat\nIdo =", i,sep=""),
+ xlab="x koordinatak", ylab="y koordinatak", col=c(rep("gray", i-1), "red"), pch=c(rep(20,i-1),1))
+ }
+     poisson_g <- matrix(c(x.new.p,y.new.p), ncol = 2)
+ return(poisson_g)
+ }
> poisson_generalt <- poisson()
```

Ábrázolása:



Vizsgálata:

```
> summary(poisson_generalt)
       V1              V2
 Min.   :  2.0   Min.   :  1.0
 1st Qu.: 90.0   1st Qu.: 78.0
 Median :174.0   Median :158.0
 Mean   :166.7   Mean   :155.1
 3rd Qu.:246.5   3rd Qu.:229.2
 Max.   :321.0   Max.   :321.0
```

4-5.feladat:

```
> details<-read.csv("C:/Users/Diak/Documents/Gazdasagi_es_penzugyi_modellek_vizsga/AMZN.csv")
>
> zaro=details$Close
```

```
> logreturn=c()
> for(i in 1:length(zaro)-1){
+   logreturn[i]=abs(log(zaro[i+1]/zaro[i]))
+ }
> chisq.test(logreturn)

        Chi-squared test for given probabilities

data:  logreturn
X-squared = 4.2944, df = 249, p-value = 1
```

Ábrázolások:

```
> hist(logreturn,main="záró árak változása, hisztogram")
> plot(logreturn)
```