GP_VIZSGA_0524

Első feladat:

```
> x="cija2k";#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= 99
> cat("ay=",ay,"\n")
ay= 105
> cat("az=",az,"\n")
az= 106
> cat("av=",av,"\n")
av= 97
> cat("ss=",ss,"\n")
ss= 588
> ar=c( "FB","AAPL","AMZN","GOOG","NFLX","TSLA")
> ai=ss-6*floor(ss/6)
> ev=2022-(ss-10*floor(ss/10))
> cat("ev=",ev,"\n")
ev= 2014
> cat("reszveny=",ar[ai+1],"\n")
reszveny= FB
```

Kétdimenziós mintarealizáció generálása:

```
> set.seed(ss)
> nx=700
> v=matrix(c(ax,abs(ax-ay),abs(ax-ay),ay),2)
> w=chol(v)
> z1=sqrt(-2*log(runif(nx)))*sin(runif(nx)*2*pi)
> z2=sqrt(-2*log(runif(nx)))*cos(runif(nx)*2*pi)
> zm=matrix(c(z1,z2),ncol=2)
> zn=5*zm%*%w
```

Statisztikai adatok vizsgálata:

```
> summary(zn)
       V1                   V2
 Min.   :-156.0506   Min.   :-162.41054
 1st Qu.: -34.0519   1st Qu.: -34.39032
 Median :   0.7749   Median :  -0.08866
 Mean   :   0.9850   Mean   :   0.14882
 3rd Qu.:  37.2042   3rd Qu.:  35.39986
 Max.   : 161.0436   Max.   : 185.24970
```

Min: Minimum értékek.

Max: Maximum értékek

1st Qu.: Első kvartilis, a megfigyelések 25%-a ennél a mennyiségnél alacsonyabb

Median: Medián

Mean: Átlag

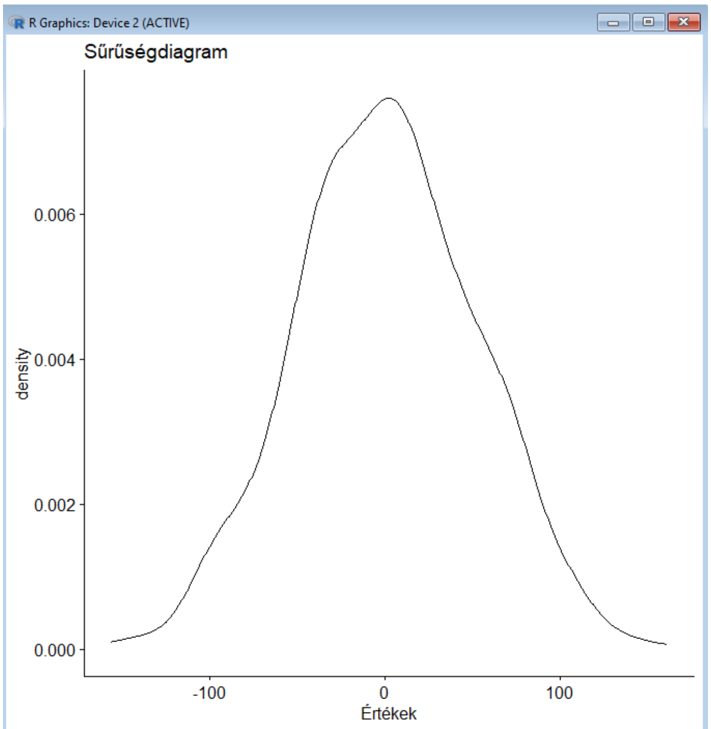
3rd Qu.: Harmadik kvartilis, a megfigyelések 25%-a ennél mennyiségnél alacsonyabb

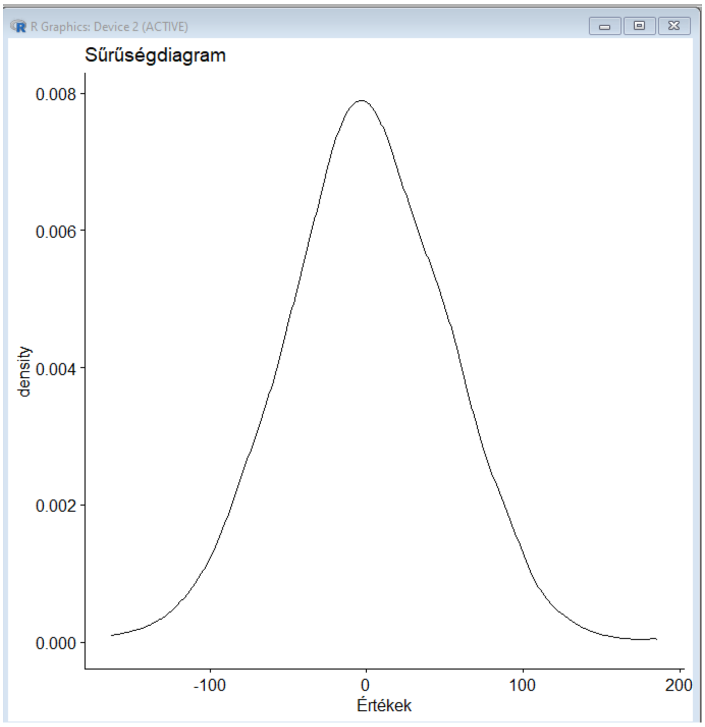
Eloszlásvizsgálat:

Vizuális igazolás beépített függvényekkel.

Sűrűségdiagrammal: A harang alakú görbe bizonyítja a normalitást.

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

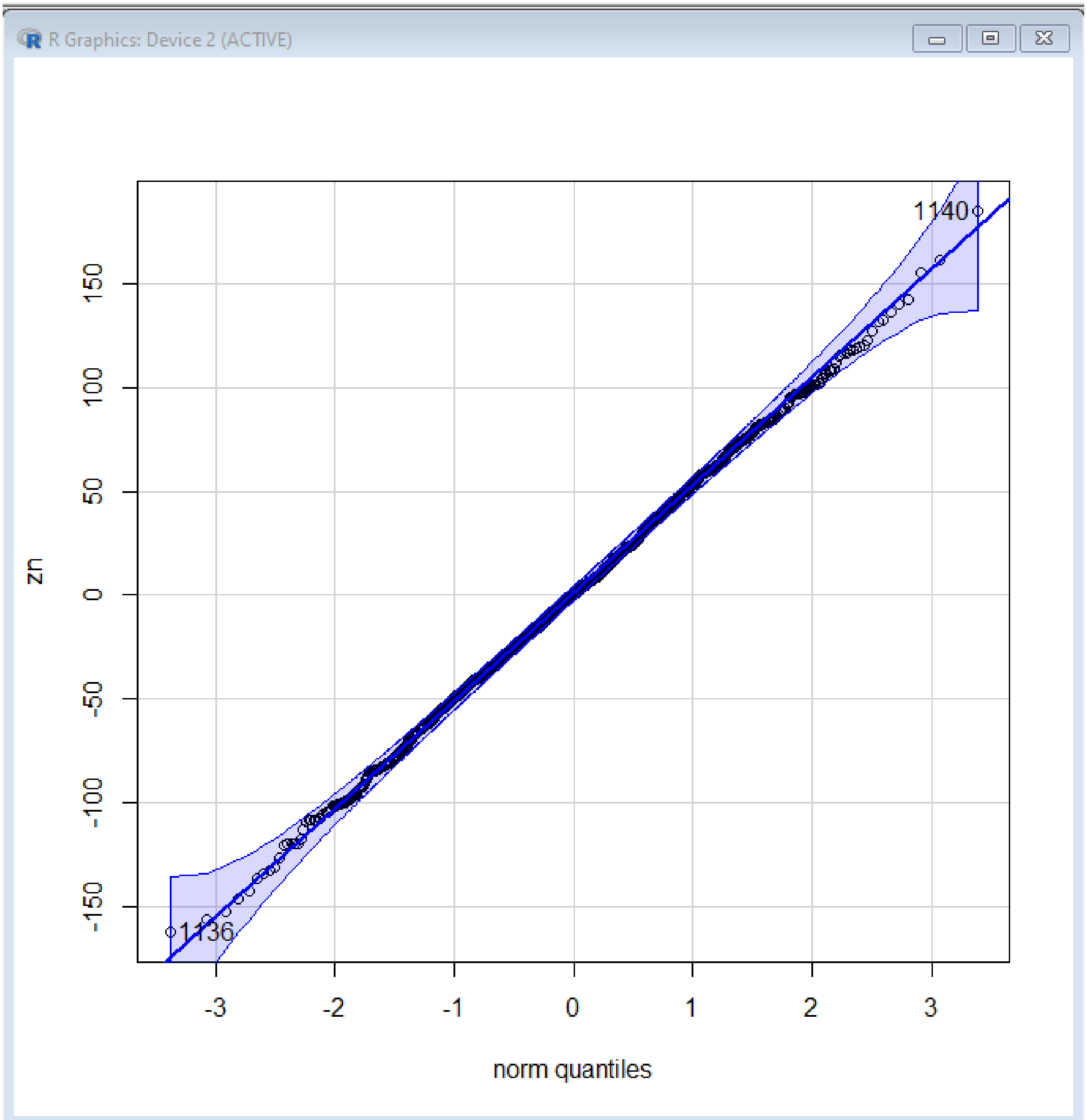




Vizsgálat kvantilis diagram alapján:

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

```
> library("car")
Loading required package: carData
> qqPlot(zn)
[1] 1140 1136
```



Tehát megállapítható, hogy normális eloszlás.

Peremek függetlensége:

Khí négyzet próbával.

```
> chisq.test(abs(zn))

        Pearson's Chi-squared test

data:  abs(zn)
X-squared = 14338, df = 699, p-value < 2.2e-16
```

Beépített függvény: chisq.test()

A p érték 2.2e-16, azaz közel van a 0-hoz. Szignifikáns.

3.feladat

Brown folyamat generálás

Ciklusokkal:

```
> gbm_ciklus <- function(nsim = 100, t = 500, 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)
+ }
```

Érték beállítása és vizsgálat:

```
> nsim <- 50
> t <- 500
> mu <- ax
> sigma <- (ax+az)/(ax+ay+az)
> S0 <- 100
> set.seed(ss+37)
> gbm <- gbm_ciklus(nsim, t, mu, sigma, S0)
> summary(gbm)
```

Output:

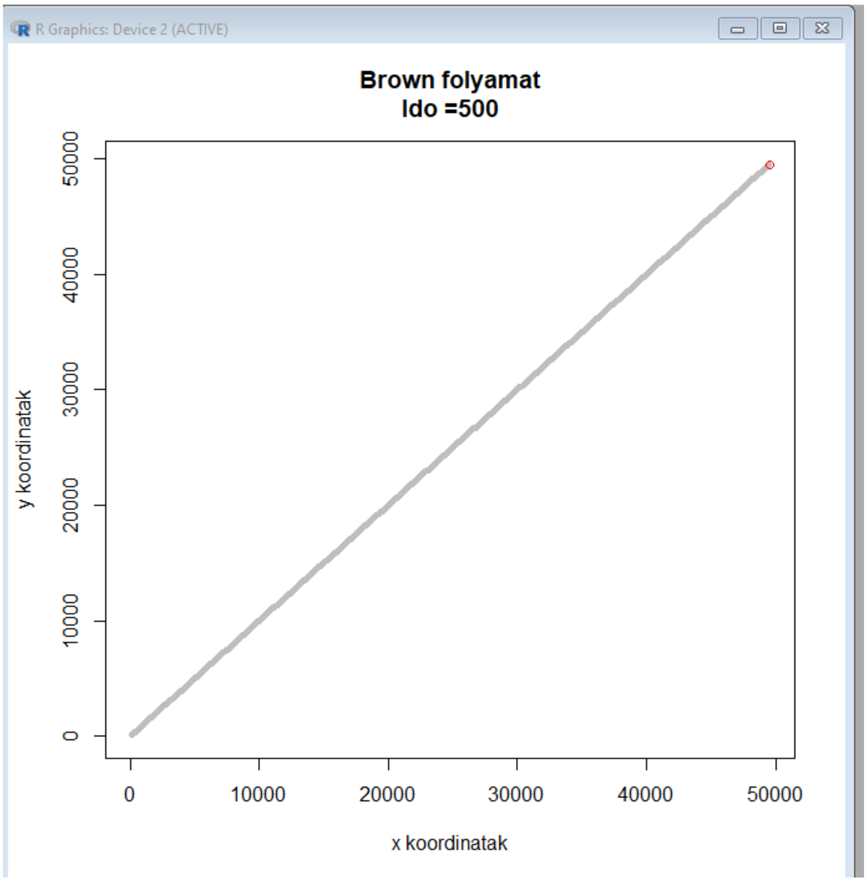
```
       V1                 V2                 V3                 V4
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:2.874e+16   1st Qu.:6.018e+16   1st Qu.:3.840e+16   1st Qu.:3.551e+16
 Median :1.301e+31   Median :2.427e+31   Median :1.879e+31   Median :1.923e+31
 Mean   :3.459e+58   Mean   :2.526e+59   Mean   :2.932e+58   Mean   :4.281e+58
 3rd Qu.:5.934e+45   3rd Qu.:2.377e+46   3rd Qu.:1.511e+46   3rd Qu.:8.042e+45
 Max.   :4.375e+60   Max.   :3.142e+61   Max.   :3.505e+60   Max.   :5.494e+60
       V5                 V6                 V7                 V8
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:4.268e+16   1st Qu.:6.572e+16   1st Qu.:5.387e+16   1st Qu.:2.921e+16
 Median :1.087e+31   Median :3.268e+31   Median :2.977e+31   Median :1.216e+31
 Mean   :2.333e+58   Mean   :6.492e+58   Mean   :4.076e+58   Mean   :3.886e+58
 3rd Qu.:4.732e+45   3rd Qu.:1.002e+46   3rd Qu.:1.041e+46   3rd Qu.:5.567e+45
 Max.   :2.712e+60   Max.   :7.697e+60   Max.   :4.729e+60   Max.   :4.676e+60
       V9                V10                V11                V12
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:3.664e+16   1st Qu.:6.855e+16   1st Qu.:8.632e+16   1st Qu.:2.871e+16
 Median :1.846e+31   Median :2.504e+31   Median :4.554e+31   Median :1.428e+31
 Mean   :7.485e+57   Mean   :4.056e+58   Mean   :1.171e+59   Mean   :6.068e+58
 3rd Qu.:4.552e+45   3rd Qu.:1.827e+46   3rd Qu.:2.702e+46   3rd Qu.:1.679e+46
 Max.   :8.904e+59   Max.   :4.810e+60   Max.   :1.455e+61   Max.   :6.884e+60
      V13                V14                V15                V16
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:4.265e+16   1st Qu.:1.040e+17   1st Qu.:3.354e+16   1st Qu.:5.708e+16
 Median :3.252e+31   Median :2.235e+31   Median :1.252e+31   Median :2.997e+31
 Mean   :5.809e+58   Mean   :4.819e+58   Mean   :2.316e+58   Mean   :1.178e+59
 3rd Qu.:1.700e+46   3rd Qu.:1.619e+46   3rd Qu.:5.961e+45   3rd Qu.:1.458e+46
 Max.   :6.918e+60   Max.   :5.999e+60   Max.   :2.683e+60   Max.   :1.431e+61
      V17                V18                V19                V20
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:4.568e+16   1st Qu.:3.501e+16   1st Qu.:5.799e+16   1st Qu.:6.744e+16
 Median :2.686e+31   Median :3.584e+31   Median :2.560e+31   Median :4.609e+31
 Mean   :3.653e+58   Mean   :5.755e+58   Mean   :6.465e+58   Mean   :1.210e+59
 3rd Qu.:1.034e+46   3rd Qu.:1.789e+46   3rd Qu.:1.711e+46   3rd Qu.:2.131e+46
 Max.   :4.319e+60   Max.   :6.790e+60   Max.   :7.694e+60   Max.   :1.577e+61
      V21                V22                V23                V24
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:5.277e+16   1st Qu.:4.736e+16   1st Qu.:4.268e+16   1st Qu.:3.731e+16
 Median :3.497e+31   Median :1.906e+31   Median :1.825e+31   Median :1.744e+31
 Mean   :4.644e+58   Mean   :3.927e+58   Mean   :3.344e+58   Mean   :1.945e+58
 3rd Qu.:9.455e+45   3rd Qu.:1.017e+46   3rd Qu.:6.813e+45   3rd Qu.:6.581e+45
 Max.   :5.252e+60   Max.   :4.834e+60   Max.   :3.784e+60   Max.   :2.406e+60
      V25                V26                V27                V28
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:3.667e+16   1st Qu.:5.218e+16   1st Qu.:2.933e+16   1st Qu.:3.911e+16
 Median :6.663e+31   Median :1.571e+31   Median :2.070e+31   Median :2.087e+31
 Mean   :1.505e+59   Mean   :2.627e+58   Mean   :4.248e+58   Mean   :6.005e+58
 3rd Qu.:4.148e+46   3rd Qu.:1.354e+46   3rd Qu.:6.984e+45   3rd Qu.:1.171e+46
 Max.   :1.701e+61   Max.   :2.924e+60   Max.   :4.870e+60   Max.   :6.773e+60
      V29                V30                V31                V32
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:2.570e+16   1st Qu.:2.391e+16   1st Qu.:5.365e+16   1st Qu.:1.719e+17
 Median :2.174e+31   Median :5.179e+30   Median :1.516e+31   Median :7.043e+31
 Mean   :6.560e+58   Mean   :1.225e+58   Mean   :3.033e+58   Mean   :6.145e+58
 3rd Qu.:1.813e+46   3rd Qu.:2.364e+45   3rd Qu.:1.037e+46   3rd Qu.:2.868e+46
```

```
      V33                 V34                 V35                 V36
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:7.431e+16   1st Qu.:3.149e+16   1st Qu.:2.958e+16   1st Qu.:2.767e+16
 Median :2.762e+31   Median :1.464e+31   Median :7.564e+30   Median :7.357e+30
 Mean   :4.197e+58   Mean   :1.929e+58   Mean   :1.364e+58   Mean   :3.011e+58
 3rd Qu.:1.204e+46   3rd Qu.:8.131e+45   3rd Qu.:4.177e+45   3rd Qu.:4.467e+45
 Max.   :5.139e+60   Max.   :2.151e+60   Max.   :1.713e+60   Max.   :3.753e+60
      V37                 V38                 V39                 V40
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:3.296e+16   1st Qu.:5.767e+16   1st Qu.:3.538e+16   1st Qu.:8.094e+16
 Median :2.732e+31   Median :5.277e+31   Median :1.808e+31   Median :3.739e+31
 Mean   :2.692e+58   Mean   :1.633e+59   Mean   :2.271e+58   Mean   :1.532e+59
 3rd Qu.:9.817e+45   3rd Qu.:3.419e+46   3rd Qu.:7.840e+45   3rd Qu.:2.611e+46
 Max.   :3.182e+60   Max.   :2.032e+61   Max.   :2.696e+60   Max.   :1.820e+61
      V41                 V42                 V43                 V44
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:6.939e+16   1st Qu.:5.404e+16   1st Qu.:2.719e+16   1st Qu.:1.583e+16
 Median :2.550e+31   Median :2.595e+31   Median :8.664e+30   Median :4.967e+30
 Mean   :2.779e+58   Mean   :9.425e+58   Mean   :3.762e+58   Mean   :1.116e+58
 3rd Qu.:8.778e+45   3rd Qu.:1.824e+46   3rd Qu.:7.434e+45   3rd Qu.:2.921e+45
 Max.   :3.317e+60   Max.   :1.166e+61   Max.   :4.487e+60   Max.   :1.348e+60
      V45                 V46                 V47                 V48
 Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:5.120e+16   1st Qu.:5.304e+16   1st Qu.:2.914e+16   1st Qu.:4.784e+16
 Median :2.084e+31   Median :2.649e+31   Median :1.992e+31   Median :1.216e+31
 Mean   :5.100e+58   Mean   :6.036e+58   Mean   :1.248e+59   Mean   :3.489e+58
 3rd Qu.:1.910e+46   3rd Qu.:1.543e+46   3rd Qu.:1.912e+46   3rd Qu.:7.730e+45
 Max.   :5.776e+60   Max.   :6.970e+60   Max.   :1.374e+61   Max.   :4.402e+60
      V49                 V50
 Min.   :1.000e+02   Min.   :1.000e+02
 1st Qu.:2.579e+16   1st Qu.:4.516e+16
 Median :1.362e+31   Median :1.379e+31
 Mean   :1.429e+58   Mean   :1.907e+58
 3rd Qu.:6.767e+45   3rd Qu.:7.305e+45
 Max.   :1.613e+60   Max.   :2.393e+60
```

Értékek beállítása és vizsgálata:

```
> brown <- function(){
+ set.seed(ss+37)
+ x <- y <- x.new <- y.new <- x.new.p <- y.new.p <- vector()
+ for(i in 1:100){
+ x <- rnorm(1, ax, (ax+az)/(ax+ay+az))
+ y <- rnorm(1, ax, (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("Brown folyamat\nIdo =", i,sep=""),
+ xlab="x koordinatak", ylab="y koordinatak", col=c(rep("gray", i-1), "red"), pch=c(rep(20,i-1),1))
+     }
+ }
> brown()
```

Ábra:

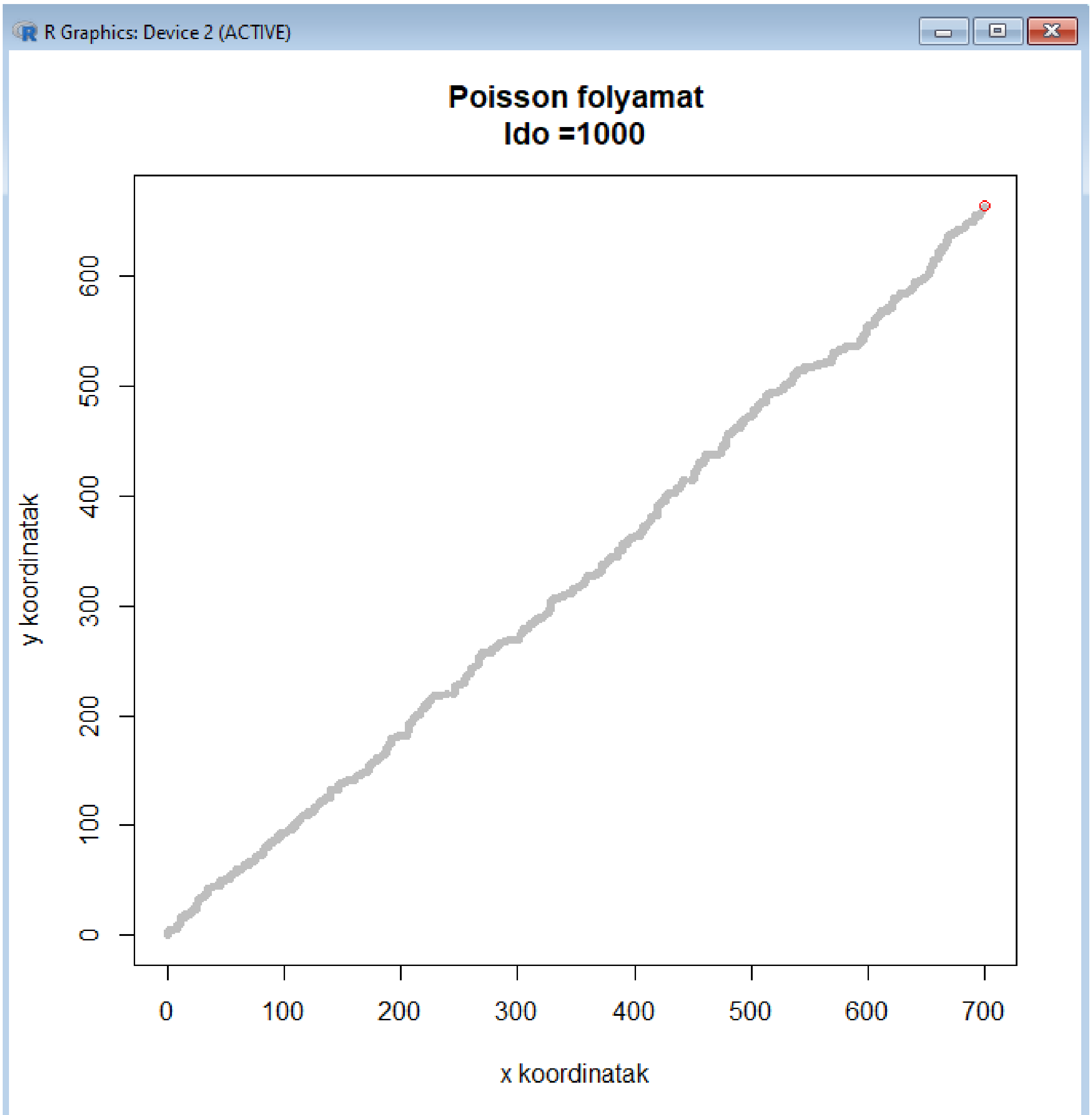


4. feladat

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 1:1000){
+ 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()
```

Ábra:



Vizsgálat:

```
> summary(poisson_generalt)
       V1              V2       
 Min.   :  0.0   Min.   :  0.0  
 1st Qu.:179.0   1st Qu.:159.0  
 Median :374.5   Median :338.0  
 Mean   :357.5   Mean   :332.3  
 3rd Qu.:535.2   3rd Qu.:506.5  
 Max.   :699.0   Max.   :665.0  
```