```
# TD2
# exo 1
# ajouter un point (25, 150)
age=c(25,35,45,55,65,75)
tension=c(150,114,124,143,158,166)
reg=lm(tension~age);summary(reg)

# attributes(reg)

# Extraction des paramètres à partir du jeu de données original
mu=reg$coef[1]
beta=reg$coef[2]
sig=summary(reg)[[6]] # summary(reg)$sigma
# Simuler un jeu de données
y=mu+beta*age+rnorm(6,0,sig) # Y=mu+bete*X+epsilon
reg2=lm(y~age)
summary(reg2)
plot(age,tension,type="p") # Tracer le nuage de points des données originales
points(age,y,col="green") # Ajouter le nuage de points des données simulées
abline(reg,col="red") # Tracer la droite de régression originale
abline(reg2,col="cyan") # Tracer la droite de régression avec les données simulées
# Simuler 100 jeux de données et tracer les droites de régression
for (i in 1:100){
   y=mu+beta*age+rnorm(6,0,sig)
   reg2=lm(y~age)
   points(age,y,col="green")
   abline(reg2,col="cyan")
}
# Retracer le modèle original
points(age,tension,type="p");
abline(reg,col="red",lwd=2)

x = as.data.frame(cbind(tension,age))
p1=predict(reg,x,interval="confidence",level=0.8, se.fit=TRUE)
p2=predict(reg,x,interval="prediction",level=0.8, se.fit=TRUE)

points( p1$fit[,2] ~age, type="l", lty="dotted")
points( p1$fit[,3] ~age, type="l", lty="dotted")
points( p2$fit[,2] ~age, type="l", lty="dashed" )
points( p2$fit[,3] ~age, type="l", lty="dashed" )
legend("topleft", c("Bande de confiance","Bande de prédiction"),lwd=1, lty=c("dotted",
"dashed"),cex=0.8)

# code du cours TD1
age=c(35,45,55,65,75)
tension=c(114,124,143,158,166)
reg=lm(tension~age); reg # lm() : calcul de regression
summary(reg) # summary() : afficher les resultats de lm()
plot(age,tension,type="p")
abline(reg,col="red")

x = as.data.frame(cbind(tension,age))
p1=predict(reg,x,interval="confidence",level=0.8, se.fit=TRUE)
p2=predict(reg,x,interval="prediction",level=0.8, se.fit=TRUE)

plot(age,tension, xlab="age", ylab= "tension")
abline(reg,col="red")
points( p1$fit[,2] ~age, type="l", lty="dotted")
points( p1$fit[,3] ~age, type="l", lty="dotted")
points( p2$fit[,2] ~age, type="l", lty="dashed" )
points( p2$fit[,3] ~age, type="l", lty="dashed" )
legend("topleft", c("Bande de confiance","Bande de prédiction"),lwd=1, lty=c("dotted",
"dashed"),cex=0.8)
plot(reg,which=1)
plot(reg,which=2)
# exo 2
# 1
n = 100; X = runif(n, 2, 10);
#X = sample(2:10, n, replace = T)
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```r
# sample(1:10)
# 2
e = rnorm(n, 0, 2)
# 3
Y = 2*X+5+e; Z = X*X+5+e
# 4
reg1 = lm(Y~X); reg2 = lm(Z~X); summary(reg1); summary(reg2)
# 5
par(mfcol = c(1,2));
x = sort(X); y = 2*x+5; z = x*x+5
#y = 2*X+5; z = X*X+5
plot(X,Y);abline(reg1, col = "red"); lines(x, y, col = "blue")
plot(X,Z);abline(reg2, col = "red"); lines(x, z, col = "blue")
# tracer manuellement la droite de regression
plot(X, reg1$fitted.values, col = "red", type = "l"); lines(x, y, col = "blue")
# tracer manuellement plot(reg1, which = 1)
par(mfrow = c(2,2));
plot( reg1$fitted.values, reg1$residuals)
plot(reg1, which = 1)
plot( reg2$fitted.values, reg2$residuals)
plot(reg2, which = 1)
# tracer les 4 graphiques des residus
par(mfrow = c(2,2));
plot(reg1, which = 1);plot(reg1, which = 2)
plot(reg1, which = 3);plot(reg1, which = 4)

par(mfrow = c(2,2));plot(reg2)
par(mfrow = c(2,2));plot(reg1)

# 6
par(mfcol = c(2,2));plot(reg1)
par(mfcol = c(2,2));plot(reg2)
#
par(mfrow = c(2,2))
plot(X,Y);abline(reg1, col = "red"); lines(x, y, col = "blue");
plot(reg1, which = 1)
plot(X,Z);abline(reg2, col = "red"); lines(x, z, col = "blue")
plot(reg2, which = 1)

# 7
reg3 = lm(log(Z)~log(X)); summary(reg3)
plot(reg3, which = 1); plot(reg2, which = 1)
```