HW06

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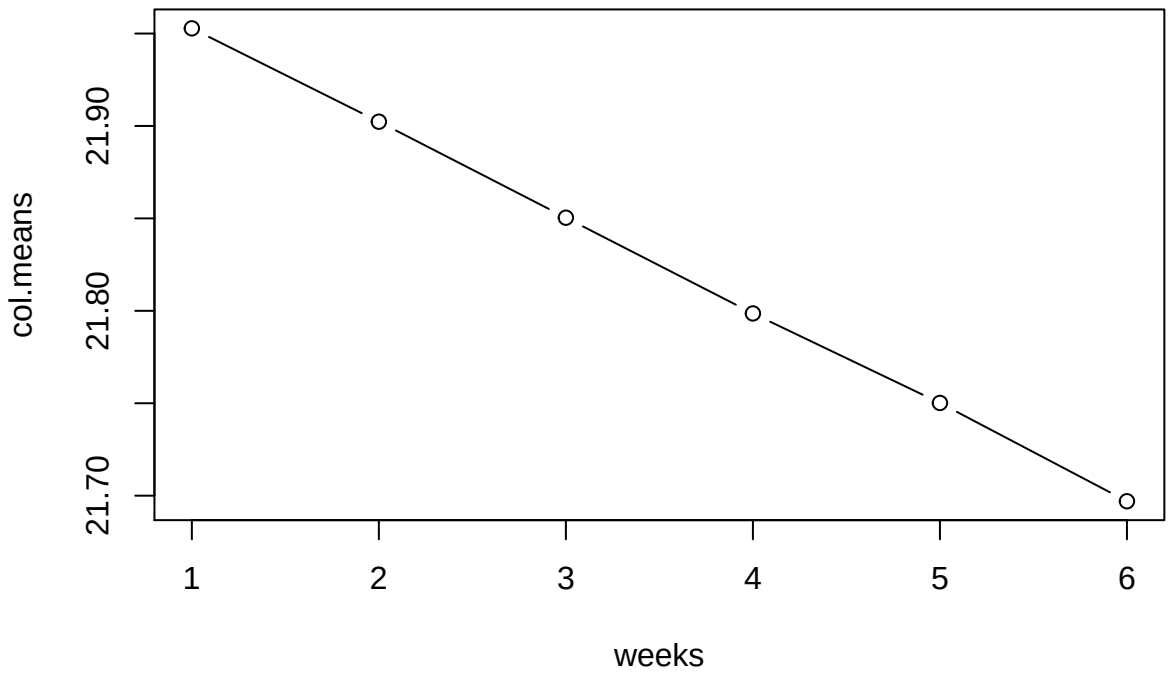
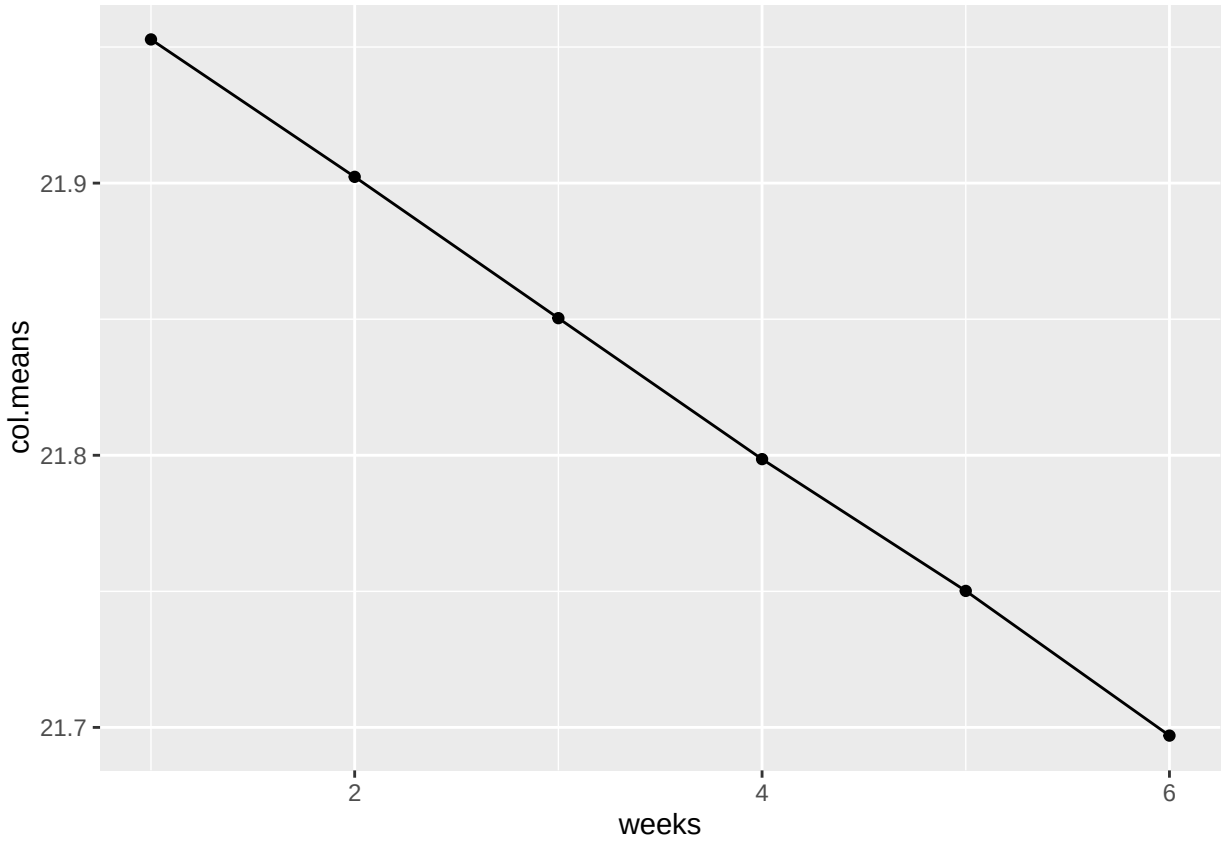
Problem 3

Part C

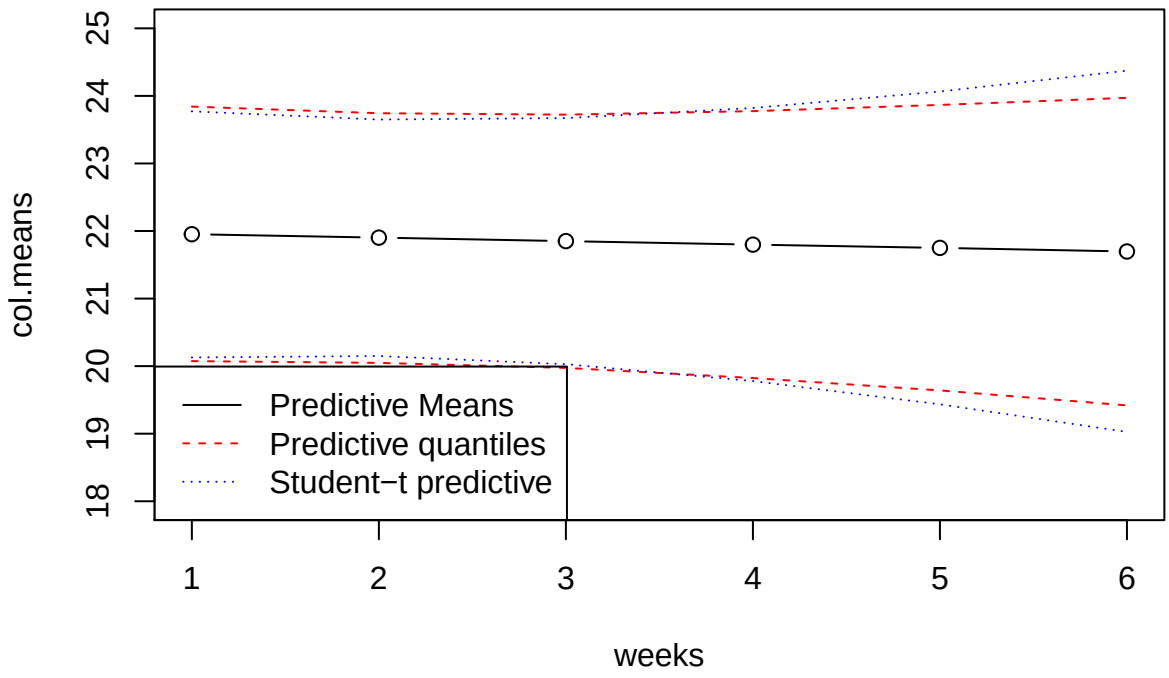
```
beta0 = 22
beta1 = -.05
phi00 = .5
phi01 = 1
phi11 = 6
nu0 = 40
SS0 =10

X = matrix(c(rep(1,6),as.factor(1:6)),6,2)

b0 = c(beta0,beta1)
xb0 = X%*%b0
phi0 = matrix(c(phi00,phi01,phi01,phi11),2,2)
inv.phi0 = solve(phi0)

sigma2.hat = SS0 / nu0

n.iter = 100000
y.star = matrix(NA,n.iter,6)
for(i in 1:n.iter){
  phi = rgamma(1,nu0/2,SS0/2)
  beta.sd = sqrt((X %*% inv.phi0 %*% t(X) + diag(6)) / phi)
  y.star[i,] = mvrnorm(1, xb0, beta.sd)
}
pred.quant = colQuantiles(y.star, probs = c(.025,.975))
col.means = colMeans(y.star)
weeks = 1:6

## t-distribution
t.quantiles = matrix(NA, 6,2)
x.phi.inv = X %*% inv.phi0 %*% t(X)
for(i in weeks){
  sigma = (x.phi.inv[i,i] + 1 ) * sigma2.hat
  t.quantiles[i,] = xb0[i] + sqrt(sigma) *qt(c(.025,.975), df = nu0)
}

pred.data.frame = as.data.frame(cbind(weeks,col.means, pred.quant))
plot(weeks,col.means, type = "b")
```




```
base = ggplot(data = pred.data.frame, aes(x = weeks))
ave.base = base + geom_line(aes(y = col.means)) + geom_point(aes(y = col.means))
ave.base
```




```
plot(weeks, col.means, ylim = c(18,25), type = "b")
lines(weeks, pred.quant[,1], lty = 2, col = "red")
lines(weeks, pred.quant[,2], lty = 2, col = "red")
lines(weeks, t.quantiles[,1], lty = 3, col = "blue")
lines(weeks, t.quantiles[,2], lty = 3, col = "blue")
legend("bottomleft", lty = c(1,2,3), legend = c("Predictive Means","Predictive quantiles","Student-t pr
```




```
data.in = mean(y.star >= 20 & y.star <= 24)
data.in
```

```
## [1] 0.94501
```

Thus another condition is met because around 0.94501 of the data is between 20 and 24, which is very near the requisite .95