Quiz #9

Please, write clearly and justify all your steps, to get proper credit for your work. If you use R, you must report the commands you use with all relevant parameters.

(1) Two rubber compounds were tested for tensile strength and the following values were found

$$A: \quad 32, 35, 31, 33, 32, 30, 33, 36, 32$$
$$B: \quad 33, 35, 36, 37, 35, 34$$

(a) Compute the sample means of the 2 populations.
(b) Compute the sample variances of the 2 populations.
(c) Assuming that the two populations are normally distributed and have the same variance, find a 99% confidence interval for the difference of the two population means $\mu_A - \mu_B$.

```
> A <-c(32, 35, 31, 33, 32, 30, 33, 36, 32)
> B <-c(33, 35, 36, 37, 35, 34)
> mean(A) = 32.66667
> mean(B) = 35
> var(A) = 3.5
> var(B) = 2
> qt(1-0.01/2,9+6-2) = 3.012276
> spooled = sqrt( (8*var(A)+5*var(B))/13 ) = 1.709701
> CI_L = mean(A)-mean(B) - qt(1-0.01/2,9+6-2)*spooled*sqrt(1/9+1/6) = -5.047669
> CI_L = mean(A)-mean(B) + qt(1-0.01/2,9+6-2)*spooled*sqrt(1/9+1/6) = 0.3810027
```

Hence the 99% confidence interval (rounding to 3 decimal digits) is

$$[-5.048, 0.381]$$

- Alternative R solution

```
> t.test(A,B,paired = FALSE, var.equal = TRUE, conf.level = 0.99)


   Two Sample t-test

data:  A and B
t = -2.5895, df = 13, p-value = 0.02245
alternative hypothesis:  true difference in means is not equal to 0
99 percent confidence interval:
-5.0476694 0.3810027
sample estimates:
mean of x mean of y
32.66667 35.00000
```