DAE8th Problem 2.9

Given:

2.9. A computer program has produced the following output for a hypothesis-testing problem:

```
Difference in sample means:  2.35
Degrees of freedom: 18
Standard error of the difference in sample means: ?
Test statistic:  t0 = 2.01
P-value: 0.0298
```

(**a**) What is the missing value for the standard error?

(**b**) Is this a two-sided or a one-sided test?

(**c**) If $\alpha = 0.05$, what are your conclusions?

(**d**) Find a 90% two-sided CI on the difference in means.

Solution:

a)

The test statistic is t0=(μ0-μ1)/stderr

Which implies that the stderr=t0/(μ0-μ1)=2.01/2.35=0.8553

b) Using 1-tcdf(2.01,18)=0.0298, which is the p-value, hence it is a one sided test.

c) a one sided test is performed by comparing the test statistic to a reference value of the t-distribution with alfa=0.05 and dF=18, which is t_ref=1.7341

as t0> t_ref, we shall **REJECT H0**.

c) here we need to construct the following inequality

$\Delta - t_{alfa/2,dF} * stderr \leq \Delta \leq \Delta + t_{alfa/2,dF} * stderr$

Where Δ is the difference in the sample means and the stderr as above. We need to realize that alfa should be 0.1 instead of 0.05 and therefore we need to find $t_{0.05,18}$, which is 1.7341. The 90% confidence interval for the difference in sample means is therefore

CI: $2.35-1.7341*0.8553 \leq 2.35 \leq 2.35+1.7341*0.8553$

Or more compactly

CI: $0.8668 \leq 2.35 \leq 3.8332$