AKSHAT GUPTA

2021515

ASSIGNMENT 2

Q1) $n = 10$
$\mu = 17$ cm
$\sigma = 0.5$ cm
→ Sample variables

Define

$H_0 : \mu_0 \leq 15$ & $H_1 : \mu_0 > 15$

$\alpha = 0.05$

Test Statistic $T(X) = \dfrac{\mu - \mu_0}{\sigma/\sqrt{n}}$ → Z-stat

Critical value obtained (CV) = -1.644854

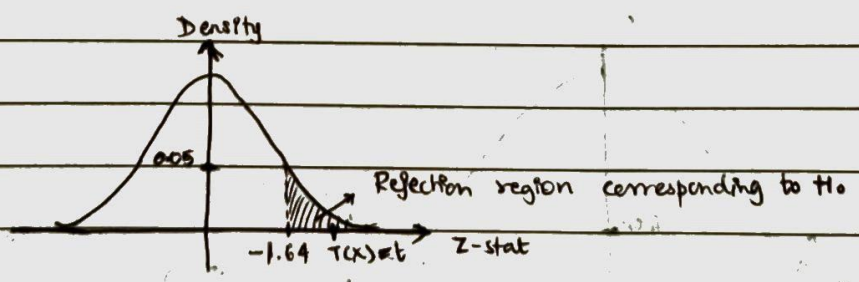
Conclusion :

H_0 is rejected.
(since $T(X) > CV$)

p-value obtained $(p) \approx 0$

Conclusion:

H_0 is rejected.
(since $p < \alpha$)



(Q2) $n = 75$

$\mu = 17.4$ yrs

$\sigma = 6.3$ yrs

Define

$H_0 : \mu_0 = 15$ & $H_1 : \mu_0 \neq 15$

$\alpha = 0.05$

Test Statistic $T(x) = \dfrac{\mu - \mu_0}{\sigma/\sqrt{n}}$ → T-stat

Critical values obtained : -1.992543 and 1.992543 $(-cv \& cv)$

Conclusion:

H_0 is rejected.

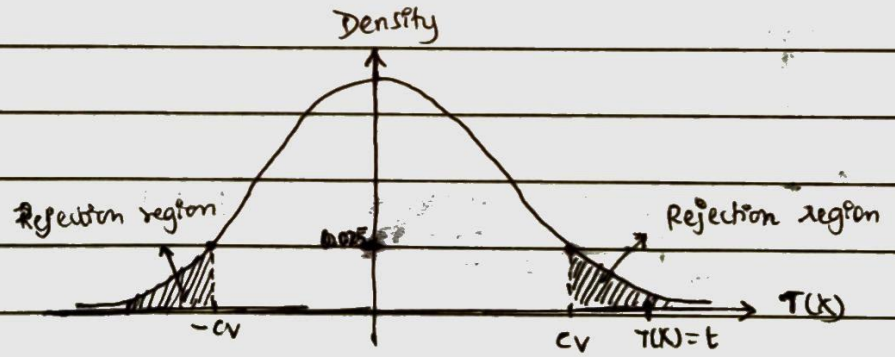
(since T-stat $T(x) > 1.992543$)

p-value obtained $(p) = 0.0007465818$

Conclusion:

H_0 is rejected

(since $p < \alpha$)



Left-tail corresponds to a significance level of $1-\alpha/2$

& Right-tail corresponds to a significance level of $\alpha/2$

(Q3) $n = 10$

Data = {14.3, 12.6, 13.7, 10.9, 13.7, 12.0, 11.4, 12.0, 12.6, 13.1}

$\mu = 12.63$

$\sigma = 1.0855306$

Define

$H_0: \mu_0 = 12$ & $H_1: \mu_0 \neq 12$

$\alpha = 0.05$

Test statistic $T(X) = \dfrac{\mu - \mu_0}{\sigma/\sqrt{n}}$ → T-stat

Critical values (cv_1 & cv_2) = −2.262157 & 2.262157

Conclusion:

H_0 is accepted

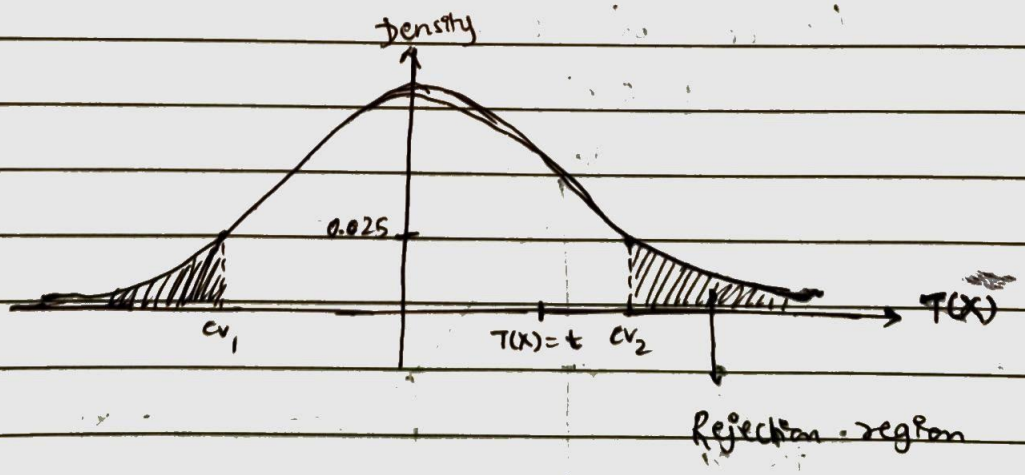
(since $cv_1 < T(X) < cv_2$)

p-value (p) = 0.9502006

Conclusion:

H_0 is accepted

(since $p > \alpha$)



(Q4) $n_1 = 9$

$n_2 = 16$

$\mu_1 = 2$

$\mu_2 = 3.2$

$\sigma_1 = \sqrt{0.75}$

$\sigma_2 = 1$

Define

$H_0 : \mu_{o_1} = \mu_{o_2}$ & $H_1 : \mu_{o_1} \neq \mu_{o_2}$

or $H_0 : \mu_{o_1} - \mu_{o_2} = 0$ & $H_1 : \mu_{o_1} - \mu_{o_2} \neq 0$

Critical values $(CV_1$ & $CV_2) = -2.306004$ & 2.306004

Conclusion:

H_0 is rejected..

(since $T(X)$ defined as $T(X) = \dfrac{(\mu_{o_1} - \mu_{o_2}) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$

is $T(X) < CV_1$)

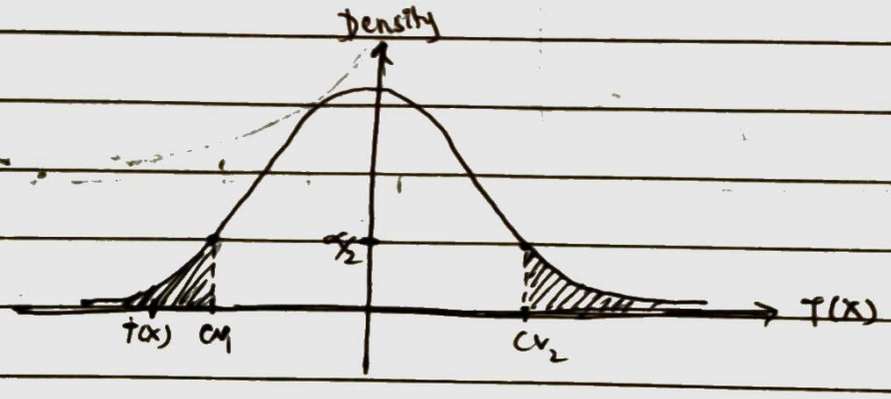
p-value $(p) = 0.01375661$

Conclusion:

H_0 is rejected

(since $\alpha = 0.05$

& $p < \alpha$)



(Q5) $S_1 = \{49, 53, 51, 52, 47, 50, 52, 53\} \longrightarrow$ Food A

$S_2 = \{52, 55, 52, 53, 50, 54, 54, 53\} \longrightarrow$ Food B

Define a sample space diff $= S_2 - S_1$

$\alpha = 0.05$

Define

$H_0 : \mu_1 - \mu_2 = 0$ & $H_1 : \mu_1 - \mu_2 \neq 0$

Using t-test (since sample distribution is known) with a confidence level of α and test stat. as the t-statistic:

t-stat = 4.320494

Estimated mean = 2

p-value = 0.003478084

Since p-value $< \alpha$,

H_0 is rejected

Estimated mean of the diff sample set $= 2 \neq 0$.

This verifies the conclusion.