Assignment 9.1

Q.1) → Given Data:-

$n = 8$ $\quad \alpha = 0.05$

$\bar{x} = 69.125$

$S = 6.104$ $\quad \frac{\alpha}{2} = 0.025$

$H_0: \mu = 65$

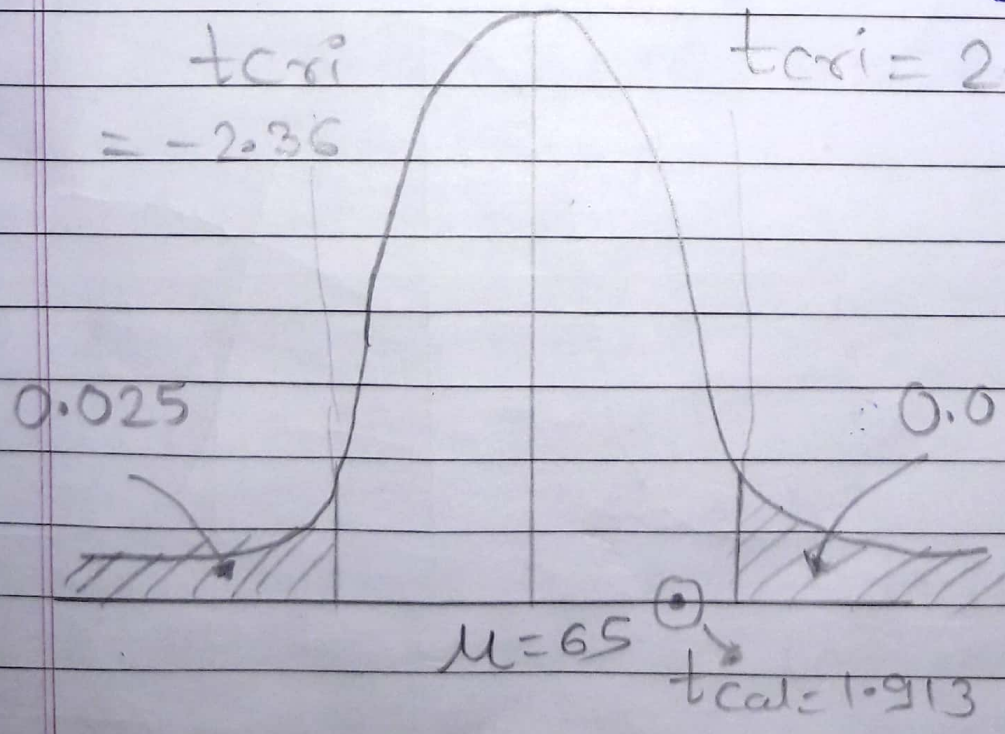
$H_1: \mu \neq 65$

$$t_{act} = \frac{\bar{x} - \mu_0}{S/\sqrt{n}} = \frac{69.125 - 65}{\frac{6.104}{\sqrt{8}}}$$

$$= \frac{4.125 \times \sqrt{8}}{6.104} = 1.913$$

$|t_{critical}| = 2.36$ (sp.t.ppf(0.025, 7))

Since $t_{act} < t_{cr}$, H_0 is ~~rejected~~ accepted.



Q.2) →

X	Y	d_i	d_i^2
90	88	2	4
90	90	0	0
100	95	5	25
88	86	2	4
95	96	3	9
		$\Sigma d_i = 12$	$42 = \Sigma d_i^2$

$$\bar{d} = \frac{\Sigma d_i}{n} = \frac{12}{5} = 2.4$$

$$Sd = \sqrt{\frac{42}{5} - (2.4)^2}$$

$$= \sqrt{8.4 - 5.76}$$

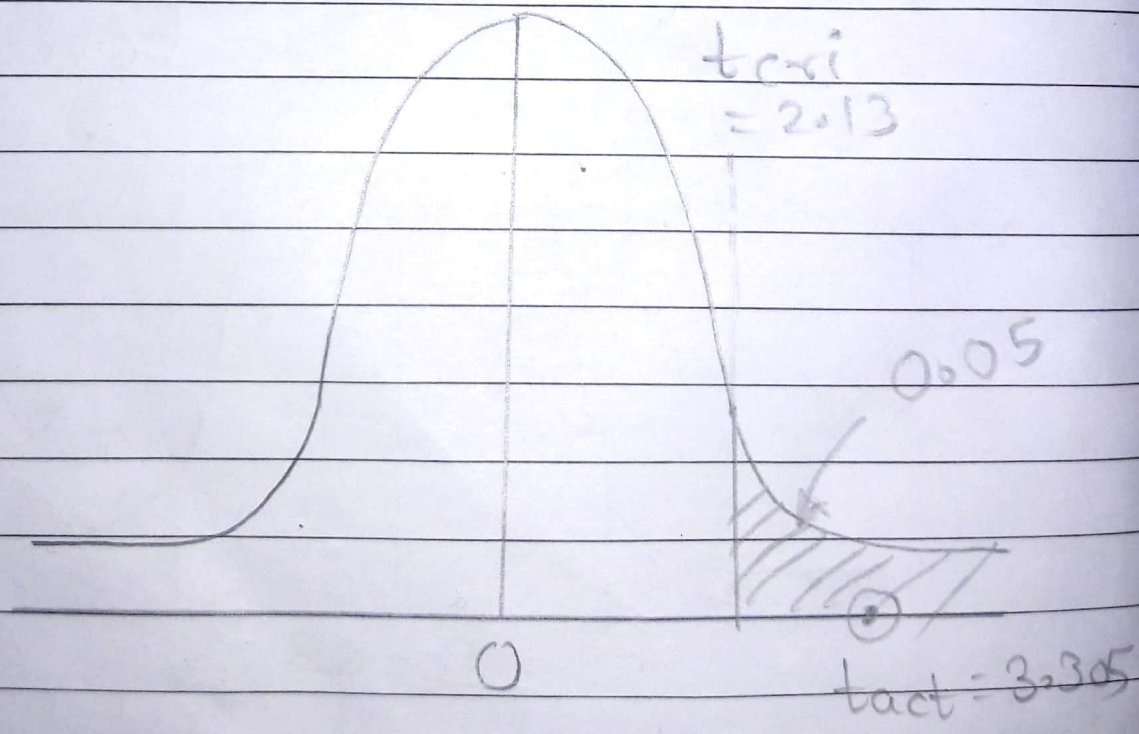
$$= \sqrt{2.64} = 1.624$$

$$\frac{Sd}{\sqrt{n}} = \frac{1.624}{\sqrt{5}} = \frac{1.624}{2.236} = 0.726$$

$$t_{act} = \frac{\bar{d}}{\frac{Sd}{\sqrt{n}}} = \frac{2.4}{0.726} = 3.305$$

$$t_{cri} = Sp.t.ppf(0.95, 4) = 2.13$$

since $t_{act} > t_{cr}$, if falls within rejection region, H_0 is rejected.



Q.3) → weights (kg)

50, 49, 52, 44, 45, 48, 46, 45, 49, 45

$\bar{x} = 47.3$

$S = 2.669$

$\alpha = 0.05$

$\frac{\alpha}{2} = 0.025$

$H_0: \mu \neq 50$

$H_1: \mu = 50$

$$t_{act} = \frac{\bar{x} - \mu}{S/\sqrt{n}}$$

$$= \frac{47.3 - 50}{\frac{2.669}{3.162}} = -3.199$$

Calculating t critical value :-

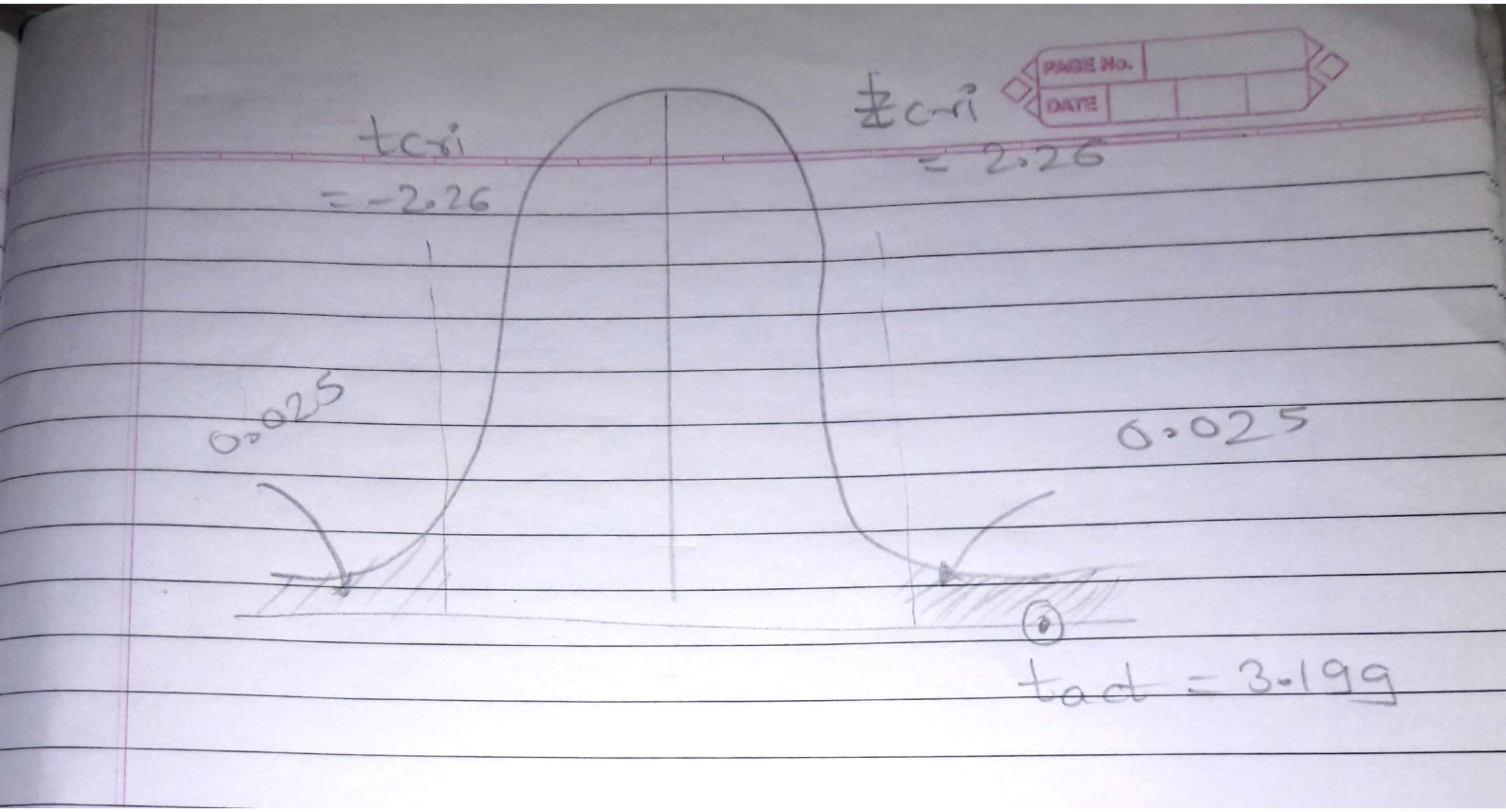
~~Sp.t. ppf (0.95, 9) = 1.83~~

$|Sp.t.\ ppf(0.025, 9)| = 2.26$

$|t_{cri}| < |t_{act}|$

$2.26 < 3.199$

So we can conclude that Null Hypothesis is rejected.



Q. 4) → $\bar{x} = 147 \quad S = 16, \quad n = 26$

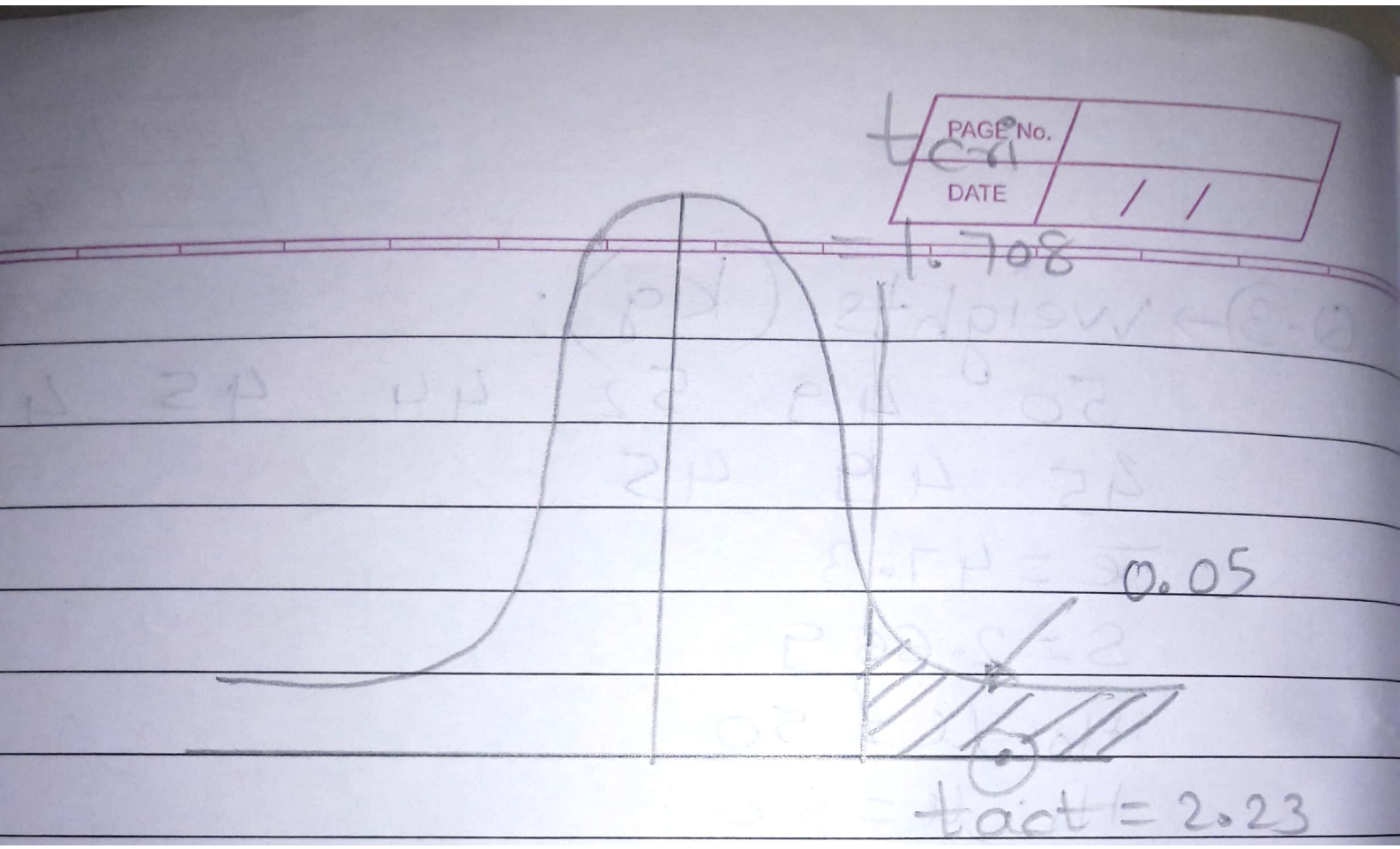
$H_0: \mu \leq 140$

$H_1: \mu > 140$

$$t_{act} = \frac{\bar{x} - \mu}{S/\sqrt{n}} = \frac{147 - 140}{16/\sqrt{26}} = 2.23$$

$t_{cr} = sp.t.ppf(0.95, 25) = 1.708$

Since, $t_{act} > t_{cr}$, it falls within rejection region. Hence H_0 is rejected.



$t_{act} = 2.23$

5] $\bar{x}_1 = 46$, $S_1 = 8.51$, $n_1 = 5$

$\bar{x}_2 = 57$ $S_2 = 12.42$, $n_2 = 7$

$H_0: \mu_1 \geq \mu_2$

$H_1: \mu_1 < \mu_2$ <

$\therefore \frac{S_1}{S_2} = \frac{8.51}{12.42} = 0.68$; we use equal Variances.

$$t_{act} = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$= \frac{46 - 57}{\sqrt{\frac{(5-1)8.51^2 + (7-1)12.42^2}{5+7-2}\left(\frac{1}{5} + \frac{1}{7}\right)}}$$

$= -1.708$

$df = n_1 + n_2 - 2 = 5 + 7 - 2 = 10$

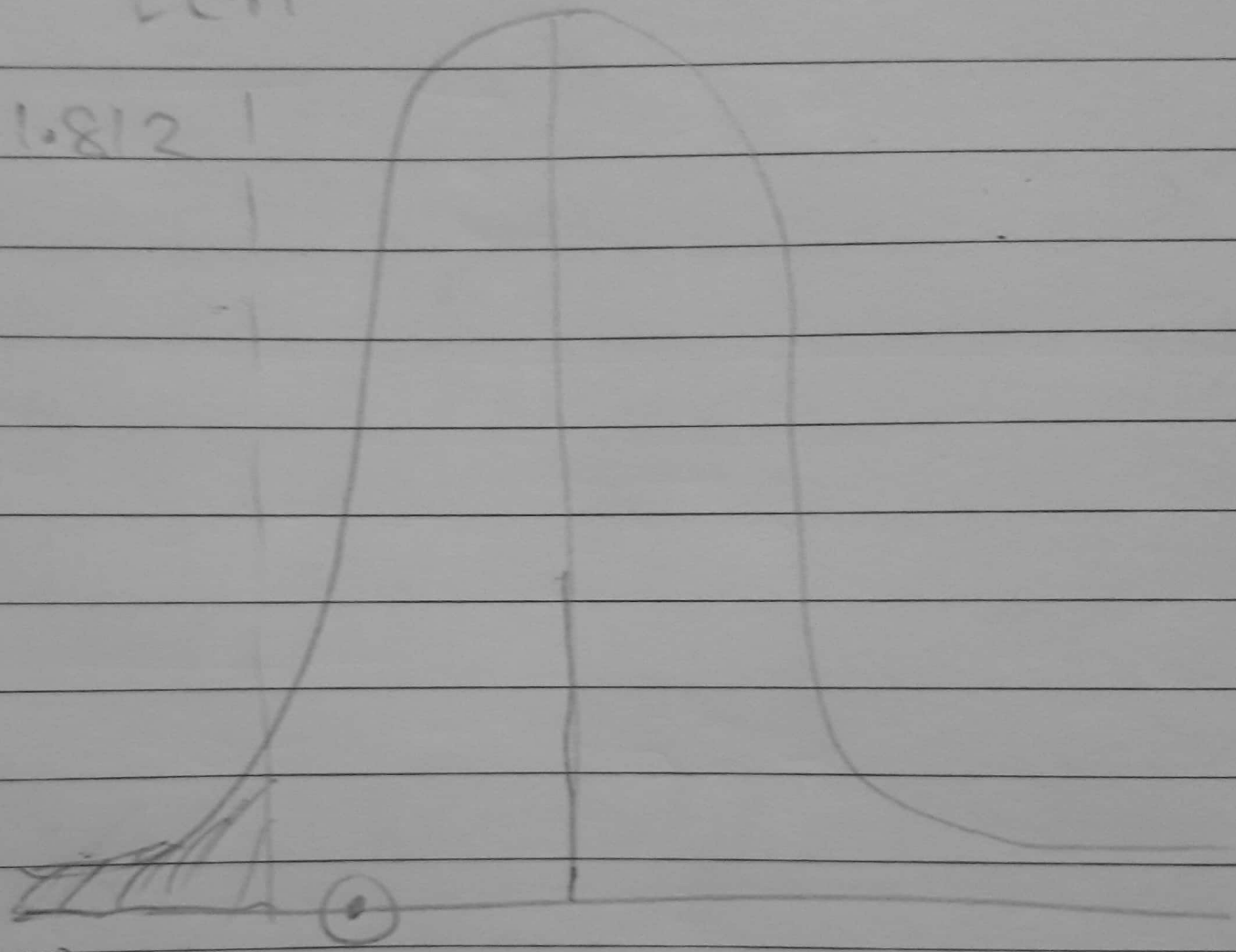
$t_{cr} = t.ppf(0.05, 10)$

$= -1.812$

Since $t_{act} > t_{cr}$ falls in acceptance region. Hence we fail to reject H_0.

t_{cri}

$= -1.812$



t_{act} $\mu_1 - \mu_2$

$= -1.708$

Q.6) → $H_0: \mu_1 = \mu_2$
$H_1: \mu_1 < \mu_2$
{ Left Tailed Test }

Typist	d	d^2
A	2	4
B	4	16
C	0	0
D	3	9
E	−1	1
F	4	16
G	−3	9
H	2	4
I	5	25
	$\Sigma d = 16$	$\Sigma d^2 = 84$

$$\bar{d} = \frac{\Sigma d}{n} = \frac{16}{9} = 1.778$$

$$S = \sqrt{\frac{1}{n-1}\left[\Sigma d^2 - \frac{(\Sigma d)^2}{n}\right]}$$

$$= \sqrt{\frac{1}{8}\left[84 - \frac{(16)^2}{9}\right]}$$

$$t_{cal} = \left| \frac{\bar{d} \cdot \sqrt{n}}{S_d} \right|$$

$$= \frac{1.778 \times 3}{2.635} = 2.024$$

$t_{cri} = sp.t.ppf(0.05, 8)$

$= -1.85$

When $t_{cal} > t_{cri}$, the Null Hypothesis is accepted. The data does not indicate that the modification in desk promotes speed in typing.

P value method :-

sp.t.cdf (2.024, 8)

$0.96 > 0.05$

So the Null Hypothesis is accepted.