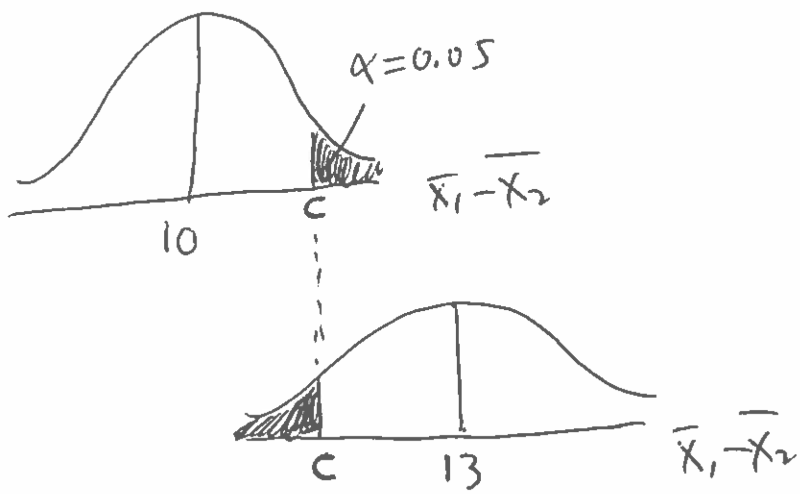
PROBLEM 1:

(a).



FIND C USING THE
THE TOP GRAPH:

$$\frac{c - 10}{\sqrt{\frac{35}{30} + \frac{25}{30}}} = 1.645 \rightarrow c = 10 + 1.645\sqrt{\frac{35}{30} + \frac{25}{30}}$$

$$c = 12.33$$

NOW FIND THE POWER
WHEN $\mu_1 - \mu_2 = 13$:

$$1 - \beta = P\left[\bar{X}_1 - \bar{X}_2 > 12.33\right] = P\left(Z > \frac{12.33 - 13}{\sqrt{\frac{35}{30} + \frac{25}{30}}}\right) = P\left[Z > -0.47\right]$$

$$= 1 - 0.3192 = 0.6808$$

(b). $$n = \frac{(Z_\alpha + Z_\beta)^2 (\sigma_1^2 + \sigma_2^2)}{\delta^2} = \frac{(1.645 + 2.325)^2 (35 + 25)}{3^2}$$

$$\Rightarrow n = 105.1 \rightarrow n \approx 106$$

IN EACH GROUP

PROBLEM 2:

(a). $H_0: \mu = 64$

$H_a: \mu < 64$

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} = \frac{62 - 64}{8/\sqrt{50}} = -1.77$$

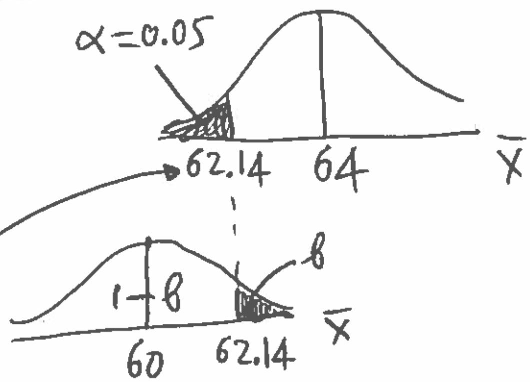
$$\text{P-VALUE} = P[t_7 < -1.77]$$ USING t TABLE

$0.025 < \text{P-VALUE} < 0.05$

CONCLUSION: REJECT Ho

(b). YES, TYPE II ERROR

(c). REJECT Ho IF $Z < -1.645$



$$\frac{c - 64}{8/\sqrt{50}} < -1.645$$

$$\Rightarrow c = 62.14$$

$$1-\beta = P[\bar{X} < 62.14] = P\left[Z < \frac{62.14 - 60}{8/\sqrt{50}}\right] = P[Z < 1.89]$$

WHEN $\mu = 60$

$$\Rightarrow 1-\beta = 0.9706$$

(d). $$n = \frac{(z_\alpha + z_\beta)^2 \sigma^2}{(\mu_a - \mu_0)^2} = \frac{(1.645 + 1.285)^2 \, 8^2}{(60-64)^2} = 34.3$$

$\alpha = 0.05 \rightarrow z_\alpha = 1.645$

$\beta = 0.10 \rightarrow z_\beta = 1.285$

$\sigma^2 = 64$

$\mu_0 = 64$

$\mu_a = 60$

$n \approx 35$.

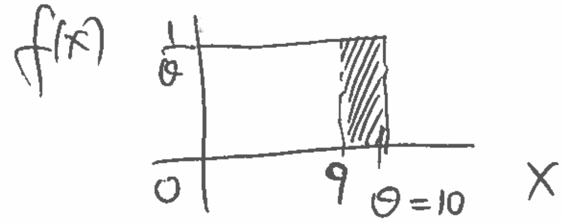
PROBLEM 3 : UNIFORM: $X \sim U(0, \theta)$ $\quad f(x) = \frac{1}{\theta}$

PROCEDURE G:

(a). $\alpha = P[X > 9] = \frac{1}{10}$

WHEN $\theta = 10$

$f(x) = \frac{1}{10}$

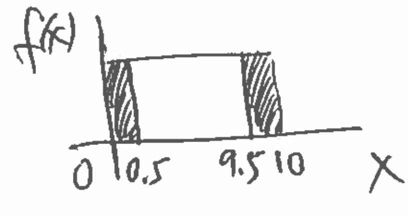


USE GEOMETRY TO COMPUTE THE AREA. NO NEED TO USE INTEGRATION!

(b). PROCEDURE K:

$\alpha = P[X > 9.5] + P[X < 0.5]$

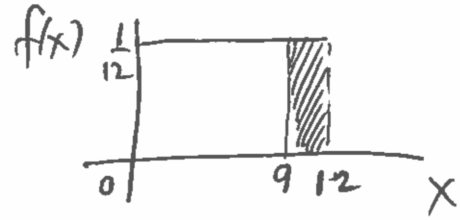
$= 0.5 \times \frac{1}{10} + 0.5 \frac{1}{10} = \frac{1}{10}$.



(c). POWER OF PROCEDURE G WHEN $\theta = 12$:

$1 - \beta = P[X > 9] = 3 \times \frac{1}{12} = \frac{1}{4}$.

WHEN $\theta = 12$

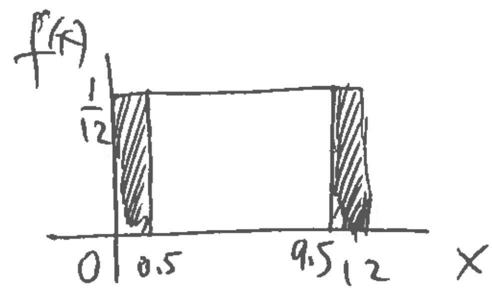


(d). POWER OF PROCEDURE K WHEN $\theta = 12$:

$1 - \beta = P[X > 9.5] + P[X < 0.5]$

WHEN $\theta = 12$

$= 0.5 \frac{1}{12} + 2.5 \frac{1}{12} = \frac{1}{4}$.



PROBLEM 5: $\frac{(n-1)s^2}{\sigma^2} \sim \chi^2_{n-1}$

WHEN THE DEGREES OF FREEDOM ARE LARGE

THEN $\frac{(n-1)s^2}{\sigma^2} \sim N\left(n-1, \sqrt{2(n-1)}\right)$

THEREFORE $Z = \dfrac{\frac{(n-1)s^2}{\sigma^2} - (n-1)}{\sqrt{2(n-1)}}$

HO IS REJECTED WHEN $Z > Z\alpha$

OR $\dfrac{\frac{(n-1)s^2}{\sigma^2} - (n-1)}{\sqrt{2(n-1)}} > Z\alpha$

$$\frac{(n-1)s^2}{\sigma^2} - (n-1) > \sqrt{2(n-1)}\ Z\alpha$$

$$\frac{(n-1)s^2}{\sigma^2} > (n-1) + Z\alpha\sqrt{2(n-1)}$$

$$s^2 > \frac{\sigma^2\left[(n-1) + Z\alpha\sqrt{2(n-1)}\right]}{n-1}$$

OR $s^2 > \sigma^2\left[1 + Z\alpha\sqrt{\frac{2}{n-1}}\right]$