Set 7

1. $P(T) = 1 - F(T)$

$$
\begin{aligned}
CDF(P) &= P_r(P(T) \le p) \\
&= P_r(1 - F(T) \le p) \\
&= P_r(F(T) \ge 1 - p) \quad F(T) \text{ is invertible! Apply } F^{-1} \text{ to both sides} \\
&= P_r(t > F^{-1}(1-p)) \quad \text{by def. of CDF} \\
&= 1 - F(F^{-1}(1-p)) \\
&= 1 - (1 - p) \\
&= p, \quad \text{which follows uniform!}
\end{aligned}
$$

2. a. α is Sig. level

α is Prob. of false rejection.

$1-\alpha$ = prob of not falsely rejecting

$(1-\alpha)^{n_0}$ = prob of not rejecting all

$1-(1-\alpha)^{n_0}$ = FWER

b. As n increases, n_0 also increases.

Thus, FWER increases as well.

c. from bernoulli's inequality:

$$(1-x)^t \geq 1-xt$$

$$x=\alpha,\ t=n_0$$

$$(1-\alpha)^{n_0} \geq 1-\alpha n_0$$

$$-(1-\alpha)^{n_0} \leq \alpha n_0 - 1$$

$$1-(1-\alpha)^{n_0} \leq \alpha n_0 \checkmark$$

d. $1-(1-\alpha)^{n} \leq \alpha n_0$ let $\alpha = \frac{\alpha}{n}$

$$1-\left(1-\frac{\alpha}{n}\right)^{n_0} \leq \frac{\alpha}{n} n_0$$

as $n \to$ large #, $n \approx n_0$ So we have

$$1-\left(1-\frac{\alpha}{n}\right)^{n_0} = \text{FWER} \leq \alpha \checkmark$$

e. $\alpha = Pr(\text{accept})$

$n-n_0$ = true negatives

$1-\left(\frac{\alpha}{n}\right)^{n-n_0}$ vs. $1-\alpha^{n-n_0}$ $\Big\rbrace$ Pr(False neg.)

if Sig. is $\frac{\alpha}{n}$, the pr of false neg. is higher.

Problem 3

https://colab.research.google.com/drive/1kJ1YqHilSoK1WMzzJOJw1vRDncb7gUUn?usp=sharing