T- DISTRIBUTION

STANDARDIZG

$\bar{X} \sim N(\mu, \frac{\sigma^2}{n})$

$Z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} \sim N(0,1)$

$\underbrace{\text{output: } \bar{X} \pm Z_{\frac{\alpha}{2}}\left(\frac{\sigma}{\sqrt{n}}\right)}_{Z \text{ interval}}$

STUDENTIZING

$t = \frac{\bar{X} - \mu}{\frac{S}{\sqrt{n}}} \sim t_{df=n-1}$

$\underbrace{\bar{X} \pm t_{\frac{\alpha}{2}, n-1}\left(\frac{S}{\sqrt{n}}\right)}_{t\text{ - interval}}$

SAMPLE VARIANCE S^2

true: $\sigma^2 = E(X-\mu)^2$

$S^2 = \frac{\sum_{i=1}^{n}(X_i - \bar{X})^2}{n-1}$

we dont know μ so we must estimate:

$\bar{X} = \frac{\sum_{i=1}^{n} X_i}{n}$

this causes the other n-1's

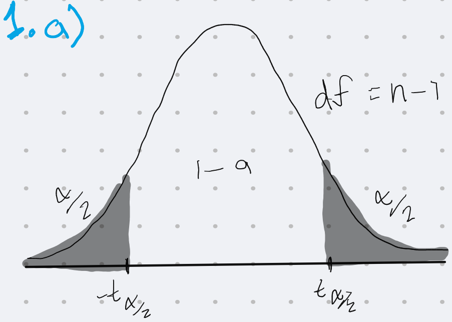
$E(S^2) = \sigma^2$

sample variance S^2 is an unbiased estimator of true variance σ^2

sample standard deviation S is a biased estimator of true standard deviation σ; however, we still use it (the bias shrinks as $n \Rightarrow \infty$)

WORKSHEET

1. a)



Given:
$\alpha = 0.05$
$n-1 = 13$ (degrees of freedom)

b) invT(0.95, 13) ≈ $\boxed{1.77}$

or using t-table: one-tail = 0.05, df = 13

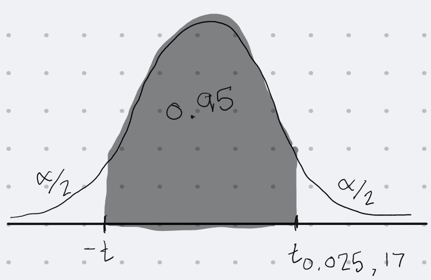
∴

t-score = 1.771

c) df = 9 ; $\alpha = 0.1$

via t-table: t-score = 1.383
⇒ −1.383 negative b/c we want to left

df = 17



via t-table: t-score = 2.110
(using two-tail)

t-table can be used as z-table by going to bottom & using very large n