ISE 2211 • Exam IV • 30 June 2020 NAME SOLUTION

On the last statistics exam, we computed a 95% confidence interval on the variance of RMS line voltage, based on sample parameters computed from fifteen voltage measurements taken by my esteemed colleague with unknown population standard deviation: $\bar{x}$ = 123.7 V and s = 1.755 V. This C.I. was **$1.651 < \sigma^2 < 7.659$ (V^2)**.
Use the C.I. to test the following hypotheses on the variance of line voltage:

H_0: $\sigma^2 = 4\ V^2$
H_1: $\sigma^2 \neq 4\ V^2$

hypothesized value of $4V^2$ is in C.I. +1

$\therefore$ fail to reject Ho +1

Test the following hypotheses on the mean value of line voltage using the fixed-α approach at α = 0.05. Sketch the appropriate distribution showing critical values, critical regions, and the test statistic.

H_0: μ = 120 V
H_0: $\mu \neq$ 120 V

+2

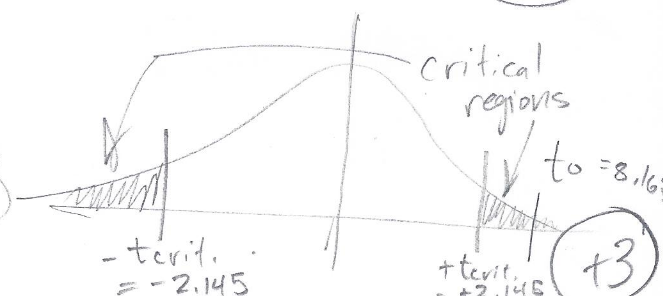
critical values: $\pm t_{\alpha/2, n-1} = \pm t_{.025, 14} = 2.145$

+1 (table)

$$t_0 = \frac{\bar{X} - \mu_0}{s/\sqrt{n}} = \frac{123.7 - 120}{1.755/\sqrt{15}} = 8.165$$ +2

$t_0 \ggg +t_{\alpha/2, n-1}$ +1

massively reject Ho +1



+3

Test the following hypotheses on the proportion of out-of-spec line voltages using the p-value approach. Sketch the appropriate distribution showing the test statistic and region corresponding to the p-value. State your final conclusion with respect to a significance level of α = 0.05. Recall that there were two out-of-spec line voltages in the sample space. Just like last week, ignore the "large sample" requirement.

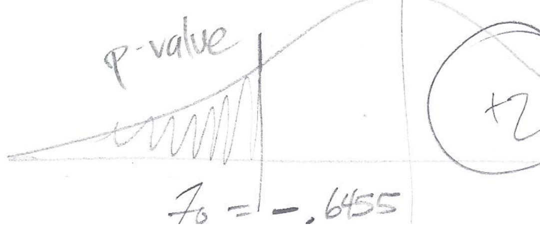
H_0: p = 20%
H_0: $p \geq$ 20%

$$Z_0 = \frac{X - np_0}{\sqrt{np_0(1-p_0)}} = \frac{2 - 15 \cdot 0.2}{\sqrt{15 \cdot 0.2(1-0.2)}} = -0.6455$$

+2

$-.65$, good enough!

p-value $= P(Z < -0.6455) = 0.257846$ +2



+2

p-value $> \alpha = 0.05$ +1

$\therefore$ fail to reject Ho +1