ISE 2211 • Exam I[redacted]• 26 June 2018 13 NAME SOLUTION

1) A transformer manufacturer claims that the efficiency of one of its core products is at least 0.925. 25 power transformers were tested at full load current and the results were $\bar{x}$ = 0.9134 and s = 0.04117. Test the following hypotheses using the p-value approach and state whether you would reject or fail to reject the null hypothesis at α = 0.05. Are the manufacturer's claims reasonable? yes

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H_0: μ = 0.925

H_1: μ < 0.925

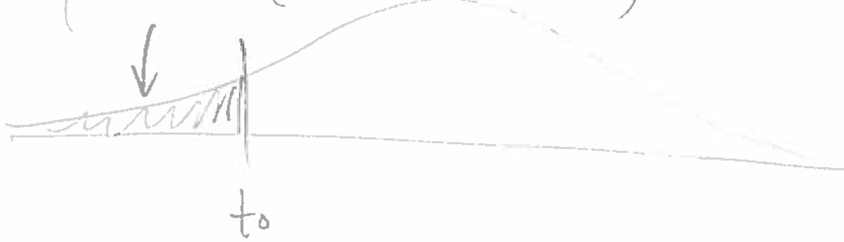
$n < 30$, σ is unkown;

∴ use T distribution +1

$$t_0 = \frac{\bar{X} - \mu_0}{s/\sqrt{n}} = \frac{0.9134 - 0.925}{0.04117/\sqrt{25}}$$

$$t_0 = -1.409$$ +1

p-value (lower one-sided)



from T-table, 25-1 = 24 degrees of freedom

$$\left.\begin{array}{l} t_{0.10,24} = 1.318 \\ t_{0.05,24} = 1.711 \end{array}\right\}$$ +2

∴ $0.05 < p < 0.10$ +1

fail to reject @ $\alpha = 0.05$ +1

2) At Yellow Springs Brewery and Above Ground Pools, it is well-known that under-filled cans are required to be taken home and consumed by YSB employees for the safety and well-being of the community. During a recent midnight canning session, twelve out of 144 cans had to be removed from the premises. Chris Hutson says this is too many and wants the ~~number~~ proportion of under-filled cans to be less than ~~10~~ 5%. Jon Vanderglas suspects sabotage!!! Test the following hypotheses on the proportion of rejected cans using the fixed-significance level approach @ $\alpha = 0.05$ and state whether you would reject or fail to reject H_0. Should Jon Vanderglas get a life? most certainly not! 3

H_0: $p = \cancel{0.10}$ 0.05

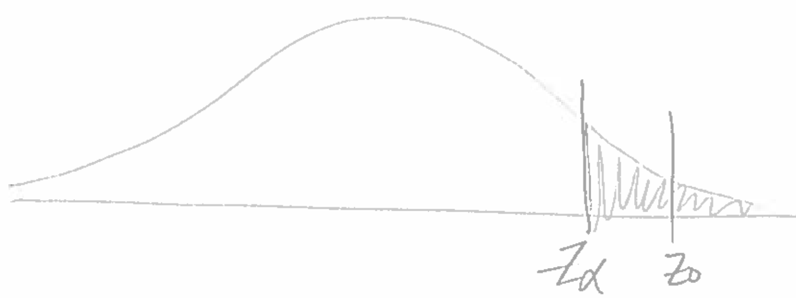
H_1: $p > \cancel{0.10}$ 0.05

$$Z_0 = \frac{X - np_0}{\sqrt{np_0(1-p_0)}}$$

$$= \frac{12 - 144 \cdot .05}{\sqrt{144 \cdot .05(1-.05)}}$$

$$Z_0 = 1.835 \quad +1$$

critical value: $Z_\alpha = Z_{0.05} = 1.645$ +1



$Z_0 > Z_\alpha$;

$\therefore$ reject H_0 +1

3) Joe Tritschler's cars over the years have usually either burned or leaked oil. His '70 Coupe DeVille burned oil with confusing inconsistency. He reckoned that a standard deviation of more than 100 miles between quarts was cause for concern, so he bought a case of 12 quarts of oil and determined that the mean number of miles between quarts was 472 miles with a sample standard deviation of 119 miles. Jon Vanderglas suspects <u>sabotage</u>!!! Test the following hypotheses at $\alpha = 0.05$: 4

H_0: $\sigma = 100$

H_1: $\sigma > 100$

$$\chi_0^2 = \frac{(n-1)s^2}{\sigma_0^2} = \frac{11 \cdot 119^2}{100^2} = 15.5771$$

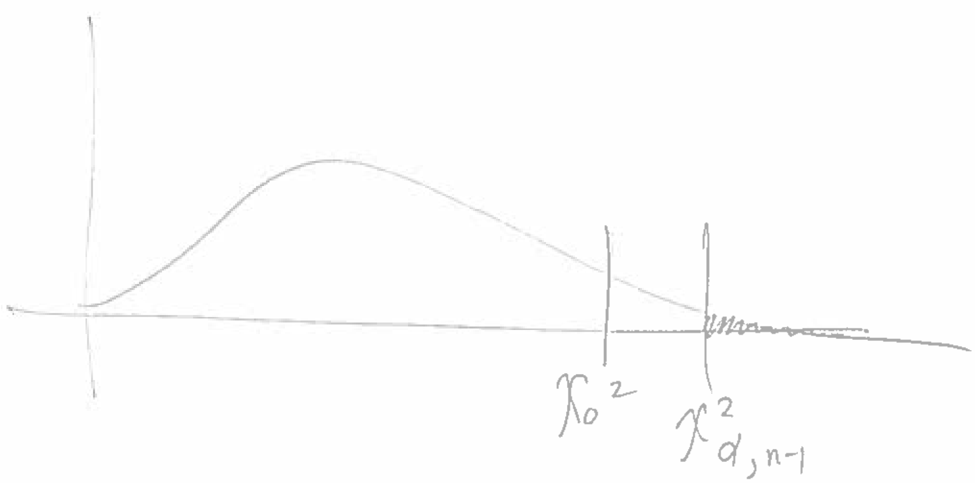
+1

critical value (upper one-sided):

(table)

$$\chi^2_{\alpha,n-1} = \chi^2_{0.05,11} = 19.68$$

+1 +1



$$\chi_0^2 \not> \chi^2_{\alpha,n-1}$$

$\therefore$ fail to reject H_0 +1