Chapter 7 Review #3 (7.3/7.4) **Prob/Stats** **Name** key

1. Describe the Type I and Type II errors for a hypothesis test of the following claim: A computer repair company advertises that the mean cost of removing a computer virus is less than \$100. Remember to state the null and alternative hypotheses first.

$H_0: \mu \geq 100$

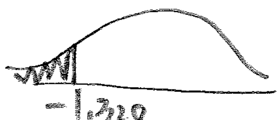
$H_a: \mu < 100$

Type I: The actual pop. mean cost of removing a computer virus is at least \$100, but we rejected H_0.

Type II: The actual pop. mean cost of removing a computer virus is less than \$100 but we failed to reject H_0.

Find the critical value(s) and rejection region(s) for the type of t-test with the level of significance and sample size given.

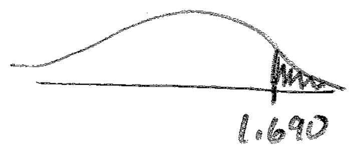
2. left-tailed, $\alpha = 0.10$, $n = 20$ df = 19



$t_0 = -1.328$

$t < -1.328$

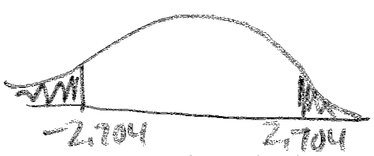
3. right-tailed, $\alpha = 0.05$, $n = 36$ df = 35



$t_0 = 1.690$

$t > 1.690$

4. two-tailed, $\alpha = 0.01$, $n = 42$ df = 41 (use 40)



$t_0 = \pm 2.704$

$t < 2.704, t > 2.704$

5. Use the calculator to get a P-value given that the population mean is 32.5, the sample mean is 32, the sample standard deviation is 2.35, and the sample size is 45. If the level of significance is $\alpha = 0.05$, would you reject or fail to reject H_0? Left-tailed test

STAT, select TESTS, #2

Highlight stats $\mu_0 = 32.5$, $\bar{x} = 32$, $S_x = 2.35$, $n = 45$, $< \mu_0$

$P = .0803$

$P > .05$ fail to reject H_0

Complete a full hypothesis test for the proportion or mean using either a z-test or t-test based on the problem. Include the hypotheses, type of test (left-tailed, right-tailed or two-tailed, sketch, either the P-value or critical value(s) and rejection region(s), the standardized test statistic (either z or t), decision to reject or fail to reject H_0, and interpret the decision in the context of the original claim. Assume the population is normally distributed.

t-test S is known

6. The average credit card debt of college students is \$3262. A college feels that students have much less credit card debt (so their claim is that college students have less than \$3262 of credit card debt). In a random study of 50 college students, the mean credit card debt was \$2995 and the standard deviation was \$1100. At the level, $\alpha = 0.05$, determine whether to reject or fail to reject the college's claim.

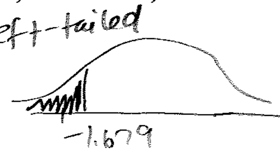
$H_0: \mu \geq 3262$

$H_a: \mu < 3262$ (claim)

$n = 50$ $\bar{x} = 2995$ $S = 1100$

$\alpha = .05$

left-tailed



$t_0 = -1.679$

$t < -1.679$

$$t = \frac{2995 - 3262}{\frac{1100}{\sqrt{50}}} = -1.72$$

$t < t_0$

reject H_0

At the 5% level of confidence, there is enough evidence to support the claim that college students have less than \$3262 of credit card debt.

or

from calculator

P-value = .0462 ≤ .05

reject

$p = .68 \quad q = .32 \qquad z - \text{normal dist.}$

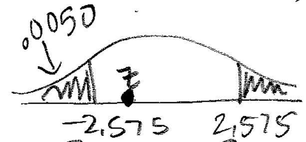
7. A study claims that 68% of the population owns a home. In a random sample of 150 households, 92 owned a home. At the $\alpha = 0.01$ level, is there enough evidence to support the claim?

$H_0: p = .68$ (claim)

$H_a: p \neq .68$

$n = 150$

$\hat{p} = \frac{92}{150} = .61$



two-tailed test

$z_0 = \pm 2.575$

$z < -2.575$ or $z > 2.575$

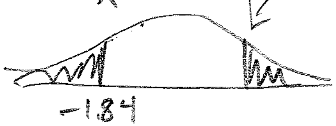
$$z = \frac{.61 - .68}{\sqrt{\frac{.68 \cdot .32}{150}}} = -1.84$$

$-1.84 > -2.575$

Fail to reject H_0

At the 1% level of significance, there is not enough evidence to reject the claim that 68% of the population owns a home.

or



P-value $= (.0329)2 = .0658$

.0658

$2(.0329) > .01$

Fail to reject H_0

8. The medical association claims there are at most 27% female physicians. In a survey of physicians, 45 of the 120 were women. Is there sufficient evidence to support the medical association at the $\alpha = 0.01$ level of significance?

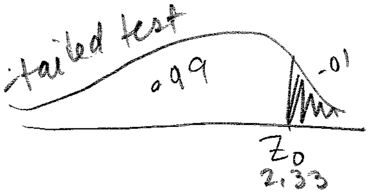
z - normal dist.

$H_0: p \le .27$ (claim)

$H_a: p > .27$

$\hat{p} = \frac{45}{120} = .375$

right-tailed test

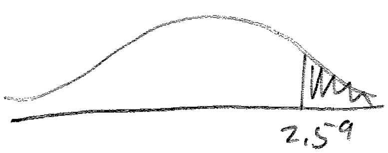


$z_0 = 2.33$

$z > 2.33$

$$z = \frac{.375 - .27}{\sqrt{\frac{.27 \cdot .73}{120}}} = 2.59$$

or



reject H_0

At the 1% level of significance, there is enough evidence to reject the claim that there are at most 27% female physicians.

$P = 1 - .9952 = .0048 \quad .0048 > .01$ reject H_0

9. The average amount of taxes paid by a family of four is greater than \$4172. A random sample of 20 families found that an average of \$4560 was paid in taxes with a standard deviation of \$1590. At $\alpha = 0.10$, is there evidence to support that families pay more than \$4172?

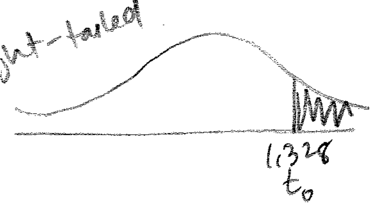
t-dist.

$n = 20 \quad \bar{x} = 4560 \quad s = 1590 \quad df = 19$

$H_0: p \le 4172$

$H_a: p > 4172$ (claim)

right-tailed



$t_0 = 1.328$

$t > 1.328$

$$t = \frac{4560 - 4172}{\frac{1590}{\sqrt{20}}} = 1.09$$

fail to reject H_0

At the 10% level of significance, there is not enough evidence to support the claim that families of four paid more than \$4172 in taxes.

Or use calculator: P-value $= .1444 \quad .1444 > .10$ Fail to reject H_0