HW11 MATH 1550 Fall 2019

§8.1

#16

Data

Diet A: $n_1 = 20$, $\bar{x}_1 = 643$, $\sigma_1 = 89$

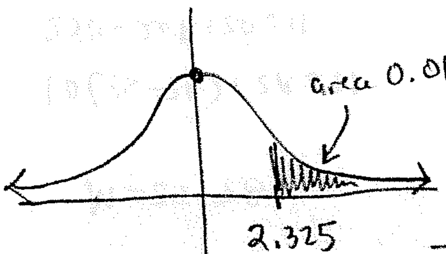
Diet B: $n_2 = 20$, $\bar{x}_2 = 588$, $\sigma_2 = 75$

$\alpha = 0.01 \rightarrow 1-\alpha = 0.99$

$H_0: \mu_1 \le \mu_2$

$H_a: \mu_1 > \mu_2 \rightarrow$ right tailed

claim



Test statistic: $$z = \frac{\bar{x}_1 - \bar{x}_2}{\sigma_{\bar{x}_1, \bar{x}_2}} = \frac{643-588}{26.0249} \approx 2.1133$$

$$\sigma_{\bar{x}_1, \bar{x}_2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} = \sqrt{\frac{89^2}{20} + \frac{75^2}{20}} \approx 26.0249$$

We fail to reject Ho, meaning there is not sufficient evidence to support the claim.

§8.2

#14

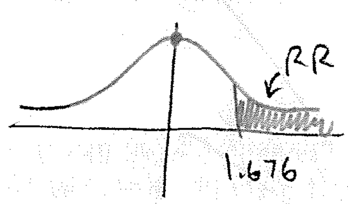
$H_0: \mu_1 \le \mu_2$ $\quad \boxed{\alpha = 0.05}$

$H_a: \mu_1 > \mu_2 \rightarrow$ right tailed

claim

Burger Stop	Fry World
$\bar{x}_1 = 5.46$	$\bar{x}_2 = 5.12$
$s_1 = 0.89$	$s_2 = 0.79$
$n_1 = 22$	$n_2 = 30$

pop variance equal $\rightarrow$ d.f. $= n_1 + n_2 - 2$
$= 52 - 2$
$= 50$



Test stat:

$$\hat{\sigma} = \sqrt{\frac{(21)(0.89)^2 + (29)(5.12)^2}{22+30-2}} \approx 3.9417$$

$$s_{\bar{x}_1 - \bar{x}_2} = \hat{\sigma}\sqrt{\frac{1}{n_1} + \frac{1}{n_2}} = (3.9417)\sqrt{\frac{1}{22} + \frac{1}{30}} \approx 1.1064$$

$$t = \frac{5.46 - 5.12}{1.1064} \approx 0.3073$$

$\Rightarrow$ Fail to reject Ho, meaning there is not sufficient evidence to support the claim.

#18

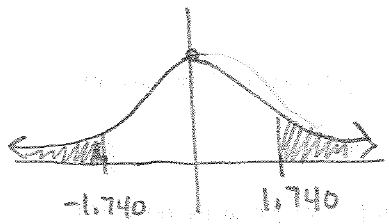
$H_0: \mu_1 = \mu_2$

claim $H_a: \mu_1 \neq \mu_2$ → two tailed

Kauai	Maui
$n_1 = 18$	$n_2 = 20$
$\bar{x}_1 = 56900$	$\bar{x}_2 = 57800$
$s_1 = 12100$	$s_2 = 8000$

pop var not equal
↓
d.f. $= \min\{17, 19\} = 17$

$\boxed{\alpha = 0.10}$



$$s_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{(12100)^2}{18} + \frac{(8000)^2}{20}} \approx 3366.5841$$

$$t = \frac{56900 - 57800}{3366.5841} \approx -0.2673$$

⇒ We fail to reject H_0, meaning there is evidence to support the claim.

§8.4 #12

$H_0: p_1 \geq p_2$

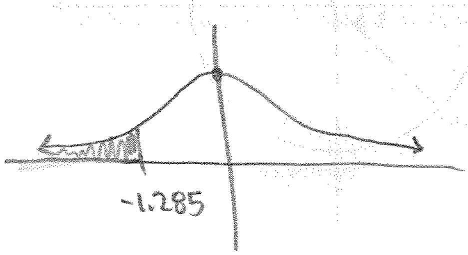
claim → $H_a: p_1 < p_2$ ← left tailed

Midwest	West
$n_1 = 340$	$n_2 = 300$
$x_1 = 289$	$x_2 = 282$

$\hat{p}_1 = \frac{289}{340} = 0.85$

$\hat{p}_2 = \frac{282}{300} = 0.94$

$\alpha = 0.1$



$$\bar{p} = \frac{289 + 282}{340 + 300} = 0.8921$$

$$\bar{q} = 1 - \bar{p} = 0.1079$$

test stat: $$z = \frac{0.85 - 0.94}{\sqrt{(0.8921)(0.1079)\left(\frac{1}{340} + \frac{1}{300}\right)}} \approx -3.662$$

We reject H_0, meaning there is evidence in support of the claim.

§10.1 #9

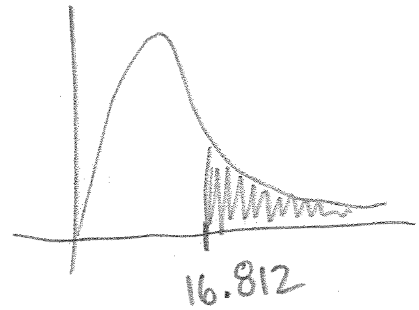
H_0: distribution matches chart → d.f. = # categories − 1

H_a: distribution does not = 7 − 1 = 6

claim

3

$n = 500$, $\alpha = 0.01$



Category	Expected	Observed
Sun	$(500)(0.07) = 35$	43
Mon	$(500)(0.04) = 20$	16
Tue	$(500)(0.06) = 30$	25
Wed	$(500)(0.13) = 65$	49
Thurs	$(500)(0.10) = 50$	46
FRI	$(500)(0.36) = 180$	168
SAT	$(500)(0.24) = 120$	153

test stat: $\chi^2 = \sum \frac{(O-E)^2}{E}$

$$= \frac{(43-35)^2}{35} + \frac{(16-20)^2}{20} + \frac{(25-30)^2}{30} + \frac{(49-65)^2}{65} + \frac{(46-50)^2}{50} + \frac{(168-180)^2}{180} + \frac{(153-120)^2}{120}$$

$= 17.5953$

We reject Ho, meaning there is evidence to support the claim.