Statistics 300 **Tue./Thu.**
Quiz #14 **7:00-8:50 p.m.** **Name:** Solution

(8 points : 15 minutes)

1. **Do carpool lanes save commute time? Use the results of the experiment below to test the claim that using the carpool lane causes the average commute time to be at least 5 minutes less per trip. For the experiment, 6 randomly selected routes from the suburbs to downtown were selected. For each route, the time required was tested using the regular lanes and using the carpool lane. The data are given below.** Use a Type I error rate of 0.05 for the test. $\Rightarrow \alpha = 0.05$

Route	Time for Lane: Regular	Carpool
1	50.3	46.6
2	28.2	28.2
3	19.9	18.5
4	24.7	16.3
5	60.1	55.7
6	58.2	57.3
$\bar{x}$ =	40.23	37.07
s =	17.99	18.44
n =	6	6

Matched pairs, Use d = regular - carpool

d
3.7
0.0
1.4
8.4
4.4
0.9

} use calculator's automatic functions to get $\bar{d} = \bar{x}$ and $s_d = s_x$

$3.133 = \bar{d}$

$3.081 = s_d$

$6 = n$

$5 = d.f.$

Regular mean $\geq$ carpool mean $+ 5$

$\mu_R \geq \mu_c + 5$

$H_0: (\mu_R - \mu_c) \geq 5$

$H_1: (\mu_R - \mu_c) < 5$

$\alpha = 0.05$ left tail

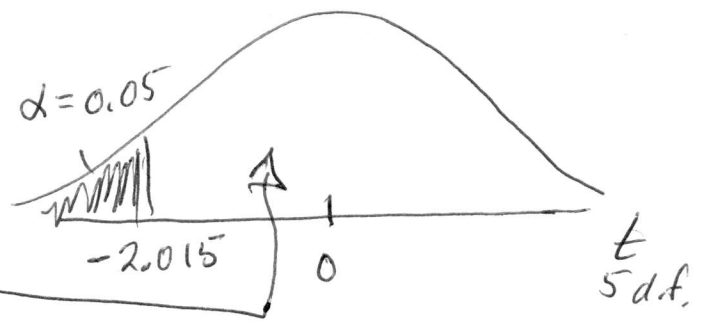
$\mu_d = (\mu_R - \mu_c)$

Test Statistic

$$\frac{\bar{d} - \mu_d}{s_d/\sqrt{n}} =$$

$$\frac{3.133 - 5}{3.081/\sqrt{6}} = \frac{-1.867}{1.258}$$

$$= -1.484$$



Do not reject H_0:

Statistics 300 **Tue./Thu.**
Quiz #14 **7:00-8:50 p.m.** **Name:** Solution

(8 points; 12 minutes)

2. The data are from an experiment to compare the effect of natural vitamins to synthetic vitamins. Six patients participated in the test. Each patient used the natural vitamins for 6 months and the synthetic vitamins for 6 months. The data are measurements of "energy level." Use the data to construct a 98% confidence interval for ($\mu_1 - \mu_2$), the difference in mean energy level that would occur if all people participated in the experiment.

	Vitamin Treatment	
Patient	**1 = Natural**	**2 = Synthetic**
1	8	6
2	6	5
3	6	5
4	9	6
5	7	8
6	8	5
Mean	7.3	5.8
St. Dev.	1.21	1.17
n	6	6

Matched Pairs
d = Natural - Synthetic

d
2
1
1
3
−1
3

put data in calculator and use automatic functions to get
$\bar{d} = \bar{x}$
$s_d = s_x$

$1.5 = \bar{d}$
$1.517 = s_d$
$6 = n$
$5 = d.f.$

confidence $= 1 - \alpha$
$0.98 = 1 - 0.02$
$\alpha = 0.02$
in 2 tails
$t_{5\ d.f.} = 3.365$

$$98\%\ CI(\mu_d) = \bar{d} \pm t_{\alpha/2}\left(\frac{s_d}{\sqrt{n}}\right)$$

$$= 1.5 \pm 3.365\left(\frac{1.517}{\sqrt{6}}\right)$$

$$= 1.5 \pm 2.08$$

$$[-0.58 < \mu_d < 3.58]$$