

HW #10

(1)[5 Pts] Let the test statistic  $W$  have a  $t$  distribution when  $H_0$  is true. Give the significance level for each of the following situations

- (i)  $H_1 : \mu > m_0$ ,  $df=15$ , rejection region  $t \geq 2.947$
- (ii)  $H_1 : \mu < m_0$ ,  $df=24$ , rejection region  $t \leq -2.500$
- (iii)  $H_1 : \mu \neq m_0$ ,  $df=30$ , rejection region  $t \leq -1.697$  or  $t \geq 1.697$

(2)[5 Pts] A tire company claims that the average mileage of a certain brand of tires can last is 29,200 miles. A sample of  $n = 22$  tires is taken at random to assess their mileage, resulting in the sample mean  $\bar{x} = 29,132$  and sample variance  $s^2 = 2,236$ . Assuming that the distribution is normal:

- (a) test the hypothesis that the true average mileage of the tires is different from 29,200 miles. Choose confidence level  $\alpha = 0.01$ .
- (b) find a 99 percent confidence interval for  $\mu$ .

(3)[5 Pts] Lightbulbs of a certain type are advertised as having an average lifetime of 750 hours. A random sample of 50 bulbs was selected, the lifetime of each bulb determined finding that the sample average lifetime is 738.5 with sample standard deviation 38.2. Test the hypothesis that the true average lifetime is smaller than what is advertised using significance level  $\alpha = 0.05$  and  $\alpha = 0.01$ .

(4)[5 Pts] A rubber compound were tested for tensile strength and the following values were found

32, 30, 31, 33, 32, 30, 29, 34, 32, 31

Assuming that the population is normally distributed, test the hypothesis that the average tensile strength is different from 31. Use  $\alpha = 0.05$ . Calculate the  $p$ -value of the test.

(5)[5 Pts] Using the same data as in Problem 4 and still assuming that the population is normally distributed, test the hypothesis that the average

tensile strength is larger than 31. Use  $\alpha = 0.05$ . Calculate the  $p$ -value of the test.

(6)[5 Pts] State DMV records indicate that of all vehicles undergoing emissions testing during the previous year, 70% passed on the first try. A random sample of 200 cars tested in a particular county during the current year yields 160 that passed on the initial test. Does this suggest that the true proportion for this county during the current year differs from the previous statewide proportion? Test the relevant hypotheses using  $\alpha = 0.05$ .