STAT 345 - Handout 10
Hypothesis Tests
BASED ON SECTIONS: 9.1 – 9.2

1. A machine is set to produce bolts with a mean length of 1 inch. Bolts that are too long or too short do not meet the customer's specifications and must be thrown out. To avoid producing too many rejects, the bolts produced by the machine are sampled from time to time and tested as a check to determine whether the machine is still operating properly. Suppose 50 bolts have been sampled and $\bar{x} = 1.02$ inches and $s = 0.04$ inch. Does the sample evidence indicate that the machine is producing bolts with a mean length not equal to 1 inch? That is, is the production process out of control?

2. The tensile strength of steel alloy for use in golf club shafts is designed to have a strength of 3500 psi. A random sample of 100 clubs gave $\bar{x} = 3250$ psi and $s = 70$ psi. Is there evidence that the mean strength is different from 3500 psi? Use $\alpha = 0.01$.

3. Tropical swarm-founding wasps, like ants and bees, rely on workers to raise their offspring. The workers of this species are mostly female, capable of producing offspring of their own. Instead, they rear the young of others in the brood. One possible explanation for this behavior is inbreeding, which increases relatedness among the wasps and makes it easier for the workers to pick out and aid their closest relatives. To test this theory, 197 swarm-founding wasps were captured in Venezuela, frozen at $-70°$C, and then subjected to a series of genetic tests. The data were used to generate an inbreeding coefficient x, for each wasp specimen. If the wasp has no tendency to inbreed the true mean inbreeding coefficient for the species will be 0. The sample mean inbreeding coefficient was $\bar{x} = 0.044$ and the sample standard deviation was $s = 0.884$. Does the true mean inbreeding coefficient exceed 0?

4. A consumer advocacy group thinks a manufacturer of light bulbs is mistaken in their claim that their bulbs on average provide 1000 hours of light. They believe the light bulbs are defective and actually provide less than 1000 hours of light. To test this they collect a random sample of $n = 100$ light bulbs and observe a sample mean of $\bar{x} = 987$ hours with a sample standard deviation of $s = 40$ hours. Set up the null and alternative hypotheses of interest. What is the p-value of this test? Would you reject H_0 at the $\alpha = 0.01$ significance level?