Name: KEY January 31, 2013 Quiz 4

1. Suppose that the mean wing beats per second of the European-American honeybee, μ , is 550. A sample of 16 African honeybees produced a mean of 450 and a standard deviation of 50. What power would result in assessing the evidence that the wing beats per second of the African honeybees is different than that of the European-American honeybee using $\alpha = 0.10$? (3pts)

$t_{\beta(1),\nu} = \delta\sqrt{n/s^2} - t_{\alpha,\nu} = 100\sqrt{16/50^2} - 1.753$

$\delta = 550 - 450 = 100$

$n = 16$ $\quad = 8 - 1.753$

$s^2 = 50^2$ $\quad = 6.247$

$t_{0.10(2),15} = 1.753$ $\quad t_{\beta(1),15} = 6.247 \quad \therefore \beta < 0.0005$

$1 - \beta > 0.9995$

2. Suppose weight measurements were taken on a sample of thirty male graduate students at the University of Illinois, exhibiting a mean of 170 lbs. Suppose also that it is known that this population has a population variance of 15 lbs^2. Find a range of plausible population means that could have generated this sample mean with 90% probability. (2pts)

$\bar{X} \pm z_{\alpha(2)} \cdot \sigma_{\bar{x}}$

$170 \pm 1.645\sqrt{\frac{15}{30}}$ $\quad$ CI $(168.837 \leq \mu \leq 171.163)$

170 ± 1.163

3. The following readings were taken at ten different department stores, each having at least ten sets turned on in their display areas. The following are radiation level readings (in milliroentgens, or mr, per hour):

0.40, 0.48, 0.60, 0.55, 0.50, 0.80, 0.50, 0.36, 0.46, 0.89

[a] Test to see if these data differ from a prior study that found a mean of 0.4 mr/hour. Define meaningful null and alternate hypotheses, choose an appropriate test statistic, and give reasons why you chose it. Test your hypothesis using 0.05 as your Type I error rate. Report a p-value for the test (bracketing is OK). State your conclusions in terms of the original problem. (5 pts)

Ho: $\mu = \mu_0 = 0.4$ mr/hr

Ha: $\mu \neq \mu_0 = 0.4$ mr/hr

use t-test since σ^2 unkn.

$t_{obs} = \frac{\bar{X} - \mu}{s_{\bar{x}}} = \frac{0.554 - 0.4}{0.05344} = 2.88$

$t_{\alpha(2),9} = 2.88$

$\therefore 0.01 < p < 0.02$

Reject Ho.

There is strong evidence that the true mean is not 0.4mr/hr

$\bar{X} = 0.554$

$\sum X_i = 5.54$

$\sum(X_i^2) = 3.3262$

$n = 10$

$s^2 = \frac{n\sum(X_i^2) - (\sum X_i)^2}{n(n-1)}$

$= \frac{10(3.3262) - (5.54)^2}{10(9)}$

$= 0.02856$

$s_{\bar{x}} = \sqrt{\frac{s^2}{n}}$

$= \sqrt{\frac{0.02856}{10}}$

$= 0.05344$