EEB 581, Problem Set Two

Due 31 January 2006

Consider the following data, assuming the x_i are iid normals.

$$\overline{x} = 10, \qquad \sum_{i=1}^{15} (x_i - \overline{x})^2 = 100, \qquad n = 15$$

1: Use **R** to find the following:

(i) X such that $\Pr(U \leq X) = 0.25$
(ii) X such that $\Pr(U \leq X) = 0.75$
(iii) X such that $\Pr(U \leq X) = 0.005$
(iv) X such that $\Pr(U \leq X) = 0.995$
(v) Redo i - iv replacing the Unit normal U with t_{14} ,a t-distribution with 14 df.

2: Suppose we know that the true variance for x is $\sigma_x^2 = 4$. Compute 50% and 99% confidence intervals for the true mean μ_x. (Hint: Results from Problem 1 many be useful!)

3: Redo Problem 2, but now assume that the variance is estimated (and hence a t-distribution is needed).

4: Assuming the appropriate normality assumptions, compute the 95% confidence interval for σ_x^2.

5: Under the null hypothesis that the true variance is 20, how likely are we to observe a value as small as the observed sample variance (which is 100/14 = 7.14)? Hint: Express this as a χ^2 probability, as we want to find $\Pr(\text{Var}(x) \leq 7.14)$.