STAT 604 Exam 2 **Fall, 1992 Dr. Newton**

1. (10 points) How would the quicksort algorithm described in class split the vector (1,2,3,4,5)?

2. (15 points) Write down in matrix form the multiple linear regression model, making sure to define the vectors and matrices involved and to specify their dimensions. Give the formula for the least squares estimators of the coefficients of the model, and those of the residual sum of squares and covariance matrix of the least squares estimators. How does one use the sweep algorithm to obtain these three quantities?

3. (20 points) Given a random sample $X_1, \ldots, X_n$ from the Gamma distribution

$$f(x; \lambda, r) = \frac{\lambda^r x^{r-1}}{\Gamma(r)} e^{-\lambda x}, \quad x \geq 0,$$

and a starting value for the parameter $\theta = (\lambda, r)^T$, how would you use Newton-Raphson to find the MLE of θ? Make sure to find any derivatives you might need.

4. (10 points) How would $-3,654.8125$ be represented as a `Real*4`?

5. (15 points) Write an S function that will generate a random sample of size `n` from the Weibull distribution

$$f(x) = \alpha\beta x^{\beta-1} e^{-\alpha x^{\beta}}, \quad x > 0,$$

using the S uniform generator.

6. (15 points) Let $X_1, \ldots, X_n$ be a random sample from a distribution having mean μ and variance σ^2. Find as simple a formula as you can for the jackknife estimator of σ^2 based on the sample variance s^2. Note that the jackknife estimator is just the average of the n individual estimators $s^2_{(i)}$.

7. (15 points) Write a Fortran function that will return the trace of an $(n \times n)$ matrix (the trace of a matrix is the sum of its diagonal elements).