STAT 604 Exam 2 **Fall, 1995 Dr. Newton**

1. (10 points) If I string out (by column) the elements of the upper triangle of an $(n \times n)$ matrix A and put the result into a vector x, what would be the index in x of $A(i,j)$?

2. (15 points) Write down the basic multiple linear regression model in matrix notation, being sure to define each of the matrices and vectors involved. What are the formulas for the least squares estimates, their variance-covariance matrix, and the residual sum of squares?

3. (15 points) How would you $\TeX$ the following:

$$(A + uv^T)^{-1} = A^{-1} - \frac{A^{-1}uv^TA^{-1}}{1 + v^TA^{-1}u}.$$

4. (20 points) Write an S function (call it `plotdray`) that will plot the pdf of the Rayleigh distribution

$$f(x) = \frac{1}{\alpha^2} x e^{-x^2/(2\alpha^2)}, \qquad x > 0,$$

from its `u1`th to `u2`th quantiles. Assume you have functions `dray` and `qray` to use in the `plotdray` function. The arguments to `plotdray` should be `alpha`, `u1`, and `u2` which should be assigned default values 1.0, 0.01, and 0.99, respectively. Nice labels on the plot would be useful but not required.

5. (15 points) What would you get as an estimator of σ^2 if you jackknifed s^2?

6. (15 points) If we use $1/\bar{X}$ as the starting value in the Newton Raphson procedure for finding the MLE of an exponential parameter λ, then $\lambda_{i+1} = 1/\bar{X}$ at every iteration.

7. (10 points) What does the following code print?

```
      double precision x(100)
      do 10 i=1,100
   10 x(i)=i
      call mysub(x,6,4,10)
      stop
      end

      subroutine mysub(A,n,m,ndim)
      double precision A(ndim,m)
      write(*,*) A(n,m)
      return
      end
```