STAT 604 Exam 1 **Fall, 1991 Dr. Newton**

1. (15 points) Using the Modified Cholesky Decomposition (MCD), show that the following matrix is not positive definite. If you haven't memorized the algorithm, you should be able to derive it.

$$A = \begin{bmatrix} 36 & 30 & 18 \\ 30 & 41 & 23 \\ 18 & 23 & 12 \end{bmatrix}$$

2. (15 points) Write a Fortran subroutine that will perform $C = AB$, where A and B are lower and upper triangular $(n \times n)$ matrices. Use as few operations as you can.

3. (15 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 $A(i, j)$?

4. (15 points) How is -473 represented as an `integer*2`?

5. (15 points) How would you TeX the following?

$$g(\alpha, \beta) = n \log \beta + \frac{1}{2\beta^2} \sum_{i=1}^{n} (\log x_i - \alpha)^2$$

6. (15 points) Given a starting value x_0, how would you use Newton's root finding method to find a relative minimum of the function

$$f(x) = (1 + x^2)\cos(2\pi x), \qquad x \in [0, 1]?$$

7. (10 points) What would be the result of the first splitting of the vector

$$7 \quad 13 \quad 8 \quad 11 \quad 15 \quad 2 \quad 7 \quad 9 \quad 17$$

in the quick sort algorithm?