STAT 604 Exam 2 **Fall, 1997 Dr. Newton**

Name: ______________________________

1. (10 pts) Find the modified Cholesky decomposition of

$$A = \begin{bmatrix} 6 & 3 & 2 \\ 3 & 5 & 1 \\ 2 & 1 & 8 \end{bmatrix}$$

2. (10 pts) If I jackknife the sample maximum M of $X_1, \ldots, X_n$, what do I get for the jackknife estimate of the population maximum and for the jacknife standard error of the maximum? You may assume that there are no two values in the data that are the same.

3. (20 pts) Given a random sample $X_1, \ldots, X_n$ from the gamma distribution having pdf

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

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

4. (10 pts) Show that a kernel density estimate using a pdf for the kernel is in fact a pdf.

5. (10 pts) How much storage is needed for a (1024×1024) computer screen having 256 colors if no compression is used?

6. (10 pts) What is represented by the following eight unsigned integers on an (8×8) square of pixels on a black and white computer screen? 252, 204, 96, 24, 96, 204, 252.

7. (10 pts) What are displayed by the Splus commands

a. `print(matrix(1:12,6,2))`

b. `print(solve(matrix(c(2,1,1,2),2,2),c(3,3)))`

8. (10 pts) Use the definition of positive definiteness to prove that if A and B are $(n \times n)$ matrices such that $A - B$ is positive definite, then each diagonal element of A must be greater than the corresponding diagonal element of B.

9. (10 pts) If I have data $X_1, \ldots, X_n$ and I want to form a histogram having M equally spaced intervals from a lower limit a to an upper limit b, how can I find the frequencies for the histogram without using any if statements?