**STAT 604 Exam 2** **Fall, 1993 Dr. Newton**

**1.** (15 points) Show that the jackknife estimator of the standard error of $\bar{X}$ is the same as the usual estimated standard error.

**2.** (15 points) Prove that

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

where $A$ is $(n \times n)$ and $u$ and $v$ are $(n \times 1)$.

**3.** (15 points) How would you use Newton-Raphson to find a relative minimum of the function

$$S(\theta) = (2\theta_1^2 + 3\theta_2^2)\exp(-\theta_1^2 - \theta_2^2)?$$

Assume you have a reasonable starting value for the process.

**4.** (15 points) Consider a computer screen having $n$ columns and $m$ rows of pixels where the lower left hand corner pixel is numbered $(0,0)$ (column 0, row 0). Suppose we want to use the rectangular region of the screen having lower left corner pixel $(c_1, r_1)$ and upper right corner pixel $(c_2, r_2)$ to represent a "real world" region having lower left corner $(x_1, y_1)$ and upper right corner $(x_2, y_2)$. Which pixel corresponds to a real world coordinate $(x, y)$?

**5.** (10 points) Show that a kernel density estimator integrates to one.

**6.** (15 points) Write a Fortran subroutine that multiplies an $(n \times n)$ unit lower triangular matrix $L$ times a $(n \times n)$ unit upper triangular matrix $R$ that never multiplies by the elements of $L$ or $R$ that we know are 1 or 0.

**7.** (15 points) What would be the new values in the array (6,4,10,2,3,9,5,8,7,11,1) after the first splitting in the quicksort algorithm?