STAT 604 Exam 1 **Fall, 1990 Dr. Newton**

Name: ____________________________

1. (12 pts) How would you TeX the following?

$$X = \begin{bmatrix} X_{11} & X_{12} & \cdots & X_{1p} \\ X_{21} & X_{22} & \cdots & X_{2p} \\ \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots \\ X_{n1} & X_{n2} & \cdots & X_{np} \end{bmatrix}$$

2. (12 pts) How is -73.4236 represented as a `real*4`? How about 7,532 as an `integer*2`?

3. (12 pts) 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?

4. (12 pts) Given a starting value x_0, how would you use Newton's root finding method to find the roots of the function

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

When you get a root, how do you check to be sure that it corresponds to a relative minimum of f?

5. (12 pts) Find the (2,2) element of the upper left hand (2 by 2) matrix in

$$\mathrm{A} = \begin{bmatrix} 6 & 4 & 3 \\ 4 & 5 & 3 \\ 3 & 3 & 4 \end{bmatrix}$$

using the SWEEP algorithm.

6. (12 pts) What number would be printed by the following program?

```
      double precision x(8,8),trace
      do 10 i=1,8
      do 10 j=1,8
10    x(i,j)=10*(i-1)+j
      write(*,*) trace(x,3)
      stop
      end
      double precision trace(a,n)
      double precision a(n,n)
      trace=0.0
      do 10 i=1,n
10    trace=trace+a(i,i)
      return
      end
```

7. (12 pts) Find the quantile function of the logistic distribution having cdf

$$F(x; \mu, \beta) = \frac{1}{1 + e^{-(x-\mu)/\beta}}, \quad x > 0.$$

8. (12 pts) If a computer can perform 1,000,000 multiplications and additions in a second, how many minutes does it take to multiply a (300 by 200) matrix times a (200 by 100) matrix 500 times?

9. (4 pts) Given data y and X satisfying the multiple linear regression model $y = X\beta + \epsilon$, what is the formula for the least squares estimator $\hat{\beta}$ of β?