

1. (10 points) What are the modified Cholesky factors of the matrix

$$A = \begin{bmatrix} 10 & 6 \\ 6 & 12 \end{bmatrix}$$

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) What would be printed by the following program:

```

      dimension a(10,5)
      do 10 i=1,10
      do 10 j=1,5
10    a(i,j)=(i-1)*10+j
      call mprint(a,5,3)
      stop
      end
      subroutine mprint(x,n,m)
      dimension x(n,m)
      do 10 i=1,n
10    write(*,*) (x(i,j),j=1,m)
      return
      end

```

4. (15 points) Write an Splus function that will find the trace of the inverse of an $(n \times n)$ matrix A . (Recall that the trace of a square matrix is the sum of its diagonal elements.)

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

Let X_1, \dots, X_n be i.i.d. with density function

$$f(x) = \begin{cases} \alpha\beta x^{\beta-1} e^{-ax^\beta}, & x > 0, \alpha > 0, \beta > 0 \\ 0, & \text{otherwise} \end{cases}$$

6. (15 points) Express -135 as an `integer*2` and 237.65625 as a `real*4`.

7. (15 points) If you have a Fortran subroutine (`runif(dseed,n,u)`) for a $U(0,1)$ random number generator, write a Fortran subroutine that will generate a random sample of size m from a binomial distribution having parameters n and p .